AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 90 William Street, New York

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

Volume XVII | NEW YORK, MAY 28, 1928 | No. 9

Testing of Wetting-Out Agents

Novel Methods Proposed—A Method for Use on Wool—Test by Weight—Preparation of Test Samples for Reliable Method—Comparison with Mill Operation

By HERBERT C. ROBERTS

THE subject of wetting-out agents is receiving no little attention at the hands of textile chemists. The class of products known as wetting-out agents include the sodium salts of propylated naphthalene sulphonic acid, hydrogenated hydrocarbons, soluble oils, and sulphonated oils of varying degrees of sulphonation and combinations of the latter products and solvents. All of these types of products owe their efficiency, as wetting-out mediums, to their property of lowering the surface tension of aqueous liquids. Some of these products have additional desirable properties, such as detergent, emulsifying and softening action. In this article the writer will not enter into the latter properties, but will discuss the methods of testing only their wetting-out properties.

Many peculiar and novel methods have been proposed to test these wetting-out agents, so that their comparative merits can be ascertained, and shipments checked. A German circular very aptly states that it is very difficult to determine the value of a wetting-out agent definitely, because they hardly ever comply with the conditions obtained in practical working. The Germans favor a method whereby equal size cuttings of different qualities of cloth are placed on the surface of the solution to be tested, and the lapse of time is determined between the moment when the fabric is placed on the solution and the moment at which it sinks below the surface. It is claimed that this gives a rough idea of the effective value of these agents.

It has been the experience of the writer that the above method is very suitable for either comparing the value of one agent against the other, or for one shipment against the standard, provided something other than cloth or raw fibers be used. The reasons for this will be brought out later. This test is certainly as close as any laboratory test ever approaches actual mill practice. The question will be raised as to how much of a standard must be kept in order to have enough to make the tests on future deliveries. However, this is a simple matter, for if a shipment has been found to be up to standard, by the same token that things equal to the same thing are equal to each other, then the shipment can itself become the standard.

A Method Proposed for Wool

J. Auerbach in the Melliand Textilberichte for 1926 proposes the following method:

> For these experiments they used raw wool cloth especially prepared in the fulling machine to secure a uniform condition of the surface. The pieces of the material were squares measuring 4 cm. on a side or 16 square cms. total. To be positive that the surface of the material used for the tests was absolutely uniform, special treatments were devised. Before using, the woolen pieces were treated so as to be certain that they all contained a uniform amount of air and moisture. The relative time necessary to completely immerse was measured with stop watches in seconds. Special precautions were taken to be certain that each piece of material was placed absolutely flat on the surface of the solution and that no air-bubbles were between the surface of the liquid and the material. The tests were conducted on 1 liter solutions of equal surface area, and each test was repeated five or more times and the tabulations represent the average.
>
> Cotton in various forms was also tried, but the results obtained were not as consistent as those with the specially prepared wool.

The great objection to this method lies in the fact that the most consistent results are obtained with wool, because it is easier to make a wool felt pad uniform and it is very difficult to obtain the same results with a cotton pad. In reality very small

amounts of wetting-out agents are used by the woolen and worsted industry unless it be to aid the penetration of a carbonizing solution. In these cases any ordinary product that contained fatty matter would naturally not be used, as there would be a tendency for the acid to "crack" the oil. Additional tests should be made to determine the acidproof character of the oil.

Furthermore, this method offers the same objection as the first method employed, when cuttings of fabric are used; i. e., the danger of false results due to air bubbles forming under the cloth and giving the cloth an added buoyancy. This also applies to raw stock.

The method of M. Frieberger, who proposes to permit a given number of drops of a wetting-out agent in an aqueous solution to fall from a burette on to a

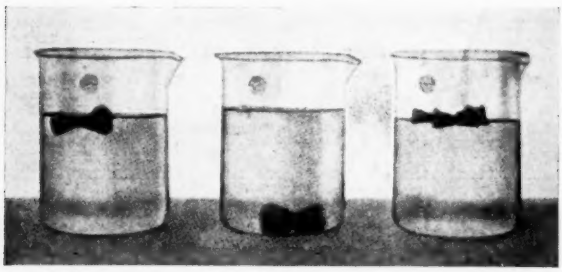

FIG. 1

dry cloth and calculate the time necessary for the drops to have been absorbed by the material, is hardly to be commended. He suggests that the drops be permitted to fall 4 cm. before reaching the cloth, and remarks that the average of at least ten such tests is necessary to obtain reliable comparisons.

This method is based on the assumption that the capillary attraction of the fibers for the liquid can be increased by chemical influence in the fiber, rather than that capillary attraction is a constant for every class of fibers, but that its action is retarded by surface tension. As the writer sees it, if this surface tension can be lowered, the capillary action of the fiber may be allowed to come more readily into play. Expressed in terms of physics, capillary action is a function of surface tension. That means to say that a wetting-out agent, by reducing surface tension of the liquid, automatically increases the rate by which the solution is absorbed by the fibers. The writer's experiments prove that any product which lowers this surface tension automatically increases the rate by which the fibers take it up.

TEST BY WEIGHT

By the Herbig method equal weights of a certain type yarn are taken, carefully weighed and prepared in such a way that it contains equal amounts of air and moisture. It is then stretched by means of a 50-gram tension and immersed for one second in the solutions to be tested or compared, immediaely hydro-extracted and weighed. The greater the increase in weight the greater absorptive power the agent has.

The great trouble with this method is the enormous amount of technique required to perform the test. Then again, the only practical application of this method would only correspond to the aiding of the penetration or absorption of caustic soda solution in mercerizing of cotton.

K. Voltz has a method which is somewhat similar and is based on the same theory that the rate of capillary absorption is a measure of the wetting out. This, of course, is true, but the method employed is diametrically opposite from actual practice. In this method as well as those of Herbig, Frieberger disregards the fact that in actual practice we are not able to treat the fiber before immersion and thereby increase the capillary, but we must lower the surface tension of the aqueous liquid employed, such as the dye bath, wetting-out bath, etc. In other words, as the writer sees it, Frieberger, Herbig, Lawrie measure the wetting-out speed by affecting the fiber before it comes in contact with the actual bath, and the other methods, such as Auerbach and Junger, lower the surface tension of the bath; thus the capillary absorption of the fiber is free to exert itself.

One method consists of taking equal lengths of raw cotton skeins and suspending them by suitable means so that one-third is immersed in the solution containing the wetting-out agents, in various strengths. The solution also contains Methylene Blue, which is seen creeping up the fibers; this means the amount of capillary attraction in the solution is more or less measured and recorded. This method must be regarded as unreliable and it will not check with the immersion tests. Many products which contain alcohol or ethylene dichloride are readily absorbed by this wick method, yet when skeins are dropped on the surface they will not wet out or sink as rapidly as other products.

F. Junger suggests a method of sprinkling various

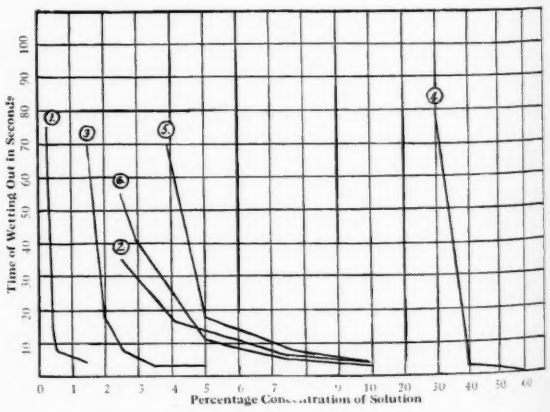

FIG. 2

Comparison of the Efficiency of Various Wetting-Out Agents

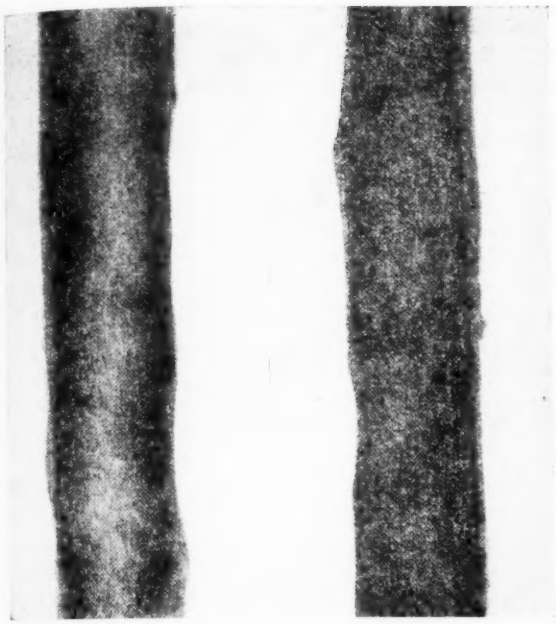

FIG. 3

fibers and dyestuffs on the surface of solutions and calculating their relative wetting-out value by the time it takes for complete immersion.

The method of L. C. Lawrie, of the British Dyestuff Corporation, is briefly as follows: A 25-c.c. capacity burette is filled with the solution of the substance under examination and this is discharged into a short length of wide glass tube, the diameter of which should be in the neighborhood of 40 mm. The upper end of the tube is open and is placed directly beneath the burette. The opposite end is covered with a piece of standard cloth held in position by means of a strong rubber band. In the experiments performed in the laboratories of the British Dyestuff Corporation the cloth used was men's wear Botany worsted serge. The piece of tube is so placed beneath the burette that the distance from the cloth to the tip of the burette is 100 mm. The diameter of the tube with a given quantity of liquid plays an important part in the test, because this determines the head of liquid which exerts the pressure on the cloth, and this accelerates the wetting-out material.

This method is open to the same criticism as the methods of Frieberger and Voltz, because it is based on the idea of altering the rate of capillary attraction by chemical means in the fiber rather than in the liquid employed. The fact that the most consistent results were obtained on a worsted fabric would indicate that this method would not be practical for cotton goods. The quantities of soap and alkali used in scouring and fulling of worsted fabrics is sufficient to break down the surface tension, and, therefore, no wetting-out agent need be employed. Ninety-five per cent of wetting-out agents are used by the cotton industry.

This test is very similar to the standard test used for testing waterproofing or water-resisting qualities of fabrics. A method of this nature is very misleading. The writer has found that the most reliable method of testing is a modification of the Auerbach method of testing wetting-out agents. It consists of taking a skein of a specified number of strands or a piece of a cotton warp and cutting this up into sections about 2 inches long. This can be done with a 2-inch die, or with a ruler and a pair of scissors.

In this way we are absolutely sure of obtaining a test sample which is composed of the same number of threads and therefore has the same surface area and is alike in moisture content, air content and cotton staple.

These sections of yarn are tied in the middle with a single knot solely for the purpose of holding all the strands together.

The two solutions under observation are then placed side by side and the test samples are dropped into the liquor simultaneously. Good checks are always to be had by this method. (See Fig. 1.)

The strength of the various solutions can be adjusted until they both have the same wetting-out speed, and then by computing the amount of wetting-out agent in each solution and multiplying these amounts by the price their relative money value is easily obtained.

All wetting-out agents exhibit characteristics which are somewhat similar. Very dilute solutions of wetting-out agents wet out the cotton very slowly. As the concentration is increased the wetting-out speed increases quite rapidly, until a certain point is reached; then this increase proceeds very slowly and finally a point is reached where a further increase in concentration does not reduce the wetting time. (See Fig. 2.)

This method of testing has been tried on raw cotton and cotton piece goods (both knitted fabrics and woven fabrics). The application to piece goods must be discarded, as there is no uniform method of dropping them to the surface of the wetting-out liquor because of air resistance. When the flat surface hits the wetting-out liquor, air bubbles are always formed, and these air pockets give the material added buoyancy.

Raw cotton cannot be taken, because it is very difficult to get two samples of raw cotton which are absolutely alike in weight and size. However, when cotton roving and slubbing have been used and reliable checks have been made, these slivers are always uniform in weight and size.

COMPARISON WITH MILL CONDITIONS

This method of testing a wetting-out agent in the laboratory has been compared with the actual operation as conducted in the dyehouse on a practical working scale, and the results have been as indicated by the laboratory test. Laboratory valuation of wetting-out agents done by the above method have been checked with the actual mill

wetting-out test on numerous sets of light-weight cotton knit goods. Two styles in particular have been tested—i. e., a 9½-yard-to-the-pound comb peeler knit goods and a 6½-yard-to-the-pound comb peeler knit goods.

In the dyehouse the positive drive of the reel and the weight of the fabric offset the buoyant effect found in the laboratory test of piece goods. These fabrics were run into the dye kettle, which had been charged with varying percentages of different wetting-out agents, and the time was recorded for the cotton fabrics to sink below the surface of the bath and become completely wet out.

Any laboratory test for valuating a product should be made for the ultimate purpose of reproducing and calculating what actually takes place under practical, large-scale working conditions. Therefore, the writer concludes from his experience that the method advanced by J. Auerbach, with the modification mentioned above, is by far the most reliable and accurate.

The method proposed by Erben and also by D. Bernhardy is open to many serious criticisms. Our experience has shown that the fatty content of these wetting-out agents has nothing to do with the wetting-out speed or the penetrating speed. As a matter of fact, we have found that a 3 per cent solution of a certain wetting-out agent has the same wetting-out effect as a 7½% solution and a 10% solution, respectively, of various types of straight sulphonated oils. (See Fig. 2.) Yet there was actually three to four times as much fat in the curve 6 as there was in curve 3. (See curves No. 3 and No. 6.)

With reference to the ability of these wetting-out agents to actually force dyestuff solutions to penetrate a fabric and evenly and uniformly color the same, we show in Fig. 3 two pieces of cotton-mixed felt dyed side by side under the same conditions. Both dye baths were charged with the same amount of dyestuff. Each dye bath contained a different wetting-out agent, but the amounts used were adjusted so that both baths contained the same fat content. This shows that there is something else besides the fat content that determines the superiority of one agent over the other.

The Scouring of Rayon

Nature of the Process—Use of Mineral Oils for Lubricating—Kerosene Residue—Working with Hard Water—Malt for Desizing

By FRED. GROVE-PALMER, A.I.C.

IN the boiling off of silk, the process that is involved is the taking away of an actual part of the substance that composes the raw fiber—that portion which is known as sericin or silk-gum, the function of which is to glue together the two fine filaments which are spun by the worm to make the bave with which it encloses itself in the cocoon; because of this the scouring or boiling off of silk is also rightly called "degumming." In the case, however, of fabrics that are woven with rayon, either alone or mixed with cotton, wool or any other fiber, we are interested in a totally different problem, the object being quite dissimilar. The purpose of the scouring of rayon fabrics is the same as for cotton materials, which is the removal of certain extraneous bodies that have been applied to the yarn with the idea of giving the warpers and weavers extra speed in their outputs by causing the threads to pass through the various processes entailed with a greatly reduced risk of breakage; in this way the amount of material that is returned from the creels, from the warping machines and from the looms is considerably increased because the breakages from the ordinary causes are reduced.

Therefore it is quite justifiable to speak of the process as "scouring," as it is in the case of wool, for it means the taking away of fatty matter that is no longer needed for the purpose of lubrication. But there is this difference, namely: the wool fat is natural to the fiber, while the fat in rayon is applied artificially.

In those plants in which the whole process of manufacturing of fabrics is carried on from the winding onto bobbins to the finishing of the material, the system of lubrication of the rayon yarn and those of all the other sorts of fiber that may be used will need to be arranged to fit in with the method of scouring, for these two stages in the general procedure should be absolutely interdependent. But there are very many cases in which the dyeing and finishing are done by firms other than those that have made the fabrics, and when this occurs the dyer should insist upon the manufacturer giving him the fullest details as to the formula employed in the oiling of the yarns. It is only when this is done that the dyer has a real chance to fix his method of scouring, before dyeing, on the proper lines for the complete removal of the impurities.

Speaking broadly, the mineral oils, if used at all, should only be used very sparingly for lubricating so delicate a fiber as rayon. In the English mills kerosene is very seldom used for this purpose; the manufacturers there have learned some useful lessons and by avoiding these dangerous oils they have raised their finishing to the high standard that it holds to-day; but there is no doubt that a number of our weavers still employ kerosene, either knowingly, because it is cheap, or unknowingly, in some of the proprietary oils that are offered by unreliable salesmen, and this results in a great increase of the ordinary troubles in the dyehouse.

Lard oil, neatsfoot oil and the majority of the better class vegetable oils which are easily saponifiable, such as

olive oil, are the type that are favored by firms which place quality in the forefront of their ideals; but when kerosene is mixed with some of these in order to lower the cost of the lubrication, it has been found that on evaporating it leaves behind it a residue that is of a peculiar gummy, tacky consistency and is strongly resistant to the action of the liquid used for boiling off. It is also by no means safe to employ even vegetable oils that have a high acid value, during the summer, as these have been found in very many instances to have a deleterious effect upon the tensile strength of the fiber; and it should never be forgotten that in rayon we are dealing with a substance that does not leave very much margin for faulty work. With cotton, if anything goes wrong it can in most cases be put right by doing something else; that is the great advantage of cotton: within certain limits it is more or less foolproof. But with rayon the same care must be taken at every turn as would be taken with silk. The mere fact that it is not so costly as silk does not make the fiber any easier to work. Any oil which shows a tendency to get viscous on storing should also be avoided for lubrication purposes whenever there is the least possibility of the goods standing in the stock cupboard for a month or two awaiting coloring orders from the purchaser.

The simplest and at the same time the most rapid method of removing the oils and fats that have been put onto the yarns for dressing is to work the cloth in a liquor consisting of: Marseilles soap, 2 pounds; ammonia (specific gravity 0.880), 2 pints; softened water, 12 gallons. The temperature of the bath should be about 130° F. and the period of working about thirty to forty-five minutes; it ought not to be necessary to have the bath hotter than that or to work the goods for a longer time. If it appears to the dyer that he has not cleared the fabric by this means, he will have to introduce a revision in his process. It is essential that softened water be used, for the presence of lime and magnesia in the bath will produce those insoluble soaps that cling to the surface of the cloth and practically defy every effort made to remove them. When these insoluble soaps appear, it is as sure as night following day that there will be trouble over the coloring, for the soaps cling about in patches and prevent the dyes from taking, the result being that the dyer has difficulty in leveling his shades. When we remember that it is never a particularly easy matter to get even dyeing on rayon, it is as well to go to any length to avoid causing additional trouble in this direction.

Working with Hard Water

A method was suggested a few months ago whereby work could be allowed to proceed even if the water-softening plant had temporarily broken down or was inadequate to the needs of the mill. This was to do the process in a vat so arranged that there was an upward displacement of the water, and by keeping the water running gently the insoluble soaps, which naturally float to the surface of the liquid, would be able to trickle away without having an opportunity of settling on the goods. The idea is sound enough and would work admirably if nothing happened; if the flow did not cease just at the moment when the cloth rose to the surface of the bath and collected up all the soap that was floating about. Dyers do not need to be reminded of the "natural cussedness of the inanimate" to know that anything that can happen will happen if it tends to be wrong. This is not cheap cynicism; it is the result of hard experience!

"White Oil" Causes Trouble

One of the ingredients that are to be found in some of those yarn-lubricating oils offered for sale is "white oil," which is very like that "toilet paraffin" or "paraffinum molle" of the drug stores, very useful for the hair. When used on rayon it is by no means easy to eliminate, for it is not acted upon by the mild alkalies that will take away the vegetable and animal oils that are preferable for oiling up the artificial fibers. The method for removing this "white oil" that has been recommended is to warm the materials in a beck of water at 130° F. in which has been dissolved a small percentage of tri-sodium metaphosphate. This must not be confused with the ordinary sodium phosphate that is largely employed in the dye-house and the tin-weighting department. The amount of this metaphosphate to be used is dependent upon the quantity of oil that is present in the goods to be treated in the vat; thus, if 2% of mineral oil is present, the liquor should contain 2% on the weight of the cloth of the phosphate. The treatment is done in an upward flow beck for about thirty minutes, after which hot water is allowed to run in at the bottom and the separated oil flows away at the top. As soon as the outgoing water is noticed to be free from globules of oil, the inlet of hot water is stopped and a dose of soap solution sufficient to make about 5% on the fabric is added, together with enough of the metaphosphate to make about 3%. The actual quantities used do not signify very much, the figures mentioned being useful as a guide. It is well not to let the material be worked too long or too violently in this rather stronger soap bath, for fear of injury to the fiber.

When it has been found that kerosene is an ingredient of the lubricating formula and has, by evaporating, left the tacky, gum-like residue already alluded to, it is probable that considerable difficulty will be experienced in getting rid of it. It not infrequently happens that it is necessary to employ benzine, benzol or some other of the volatile solvents used in the dry-cleaning trade to accomplish the removal. As these solvents generally are very highly inflammable, precautions must be taken against the risk of fire, for the average dye works is not equipped for dealing with a problem of this sort in the same manner that a "dyer and cleaner" is. Incidentally, when the dyer finds he is up against a snag of this sort he should make his customers thoroughly well acquainted with his views on the subject.

When the warps have been sized with any of the starches and many of the gums, the removal is effected

in rather a different way. Malt is, perhaps, the best substance for tackling these sizes; usually a 5% bath is strong enough and the goods may be left lying in this as long as possible. For slight sizing an hour or so may be long enough; for heavy sizing four or five hours, or even over night, may be needed. In using this bath the temperature is a matter of great importance, for the taking out of the starch depends upon a fermentation reaction; if the liquor is either too hot or too cold this action will not go on, and consequently the time will be wasted, to say nothing of the cost of the malt, which is not so cheap that we can afford to throw it away. The bath, therefore, must be kept during the whole time of its action at a narrow range of temperature between 130 and 135° F. After use the malt solution may be allowed to cool down, and it will keep good for quite a long time for successive treatings. Whenever a fresh batch of goods is to be put in, the original volume of the vat should be made up by the addition of 5% solution. When the malt has been used a number of times, it sometimes begins to show a brown coloration which may tend to discolor the material that is soaked in it. Of course, rather than risk this, it is better to throw it away and begin again.

Some of the gums do not yield to this treatment; and in such cases, and also when glue and gelatine have been used, it is usually sufficient to soak the warp or the cloth in warm water containing 5% of soluble oil, and then work them for half an hour. After raising and allowing the material to drain, it should be scoured in the soap and ammonia bath that was described above.

It cannot be too strongly emphasized that when a dyer receives batches of goods concerning which he is not perfectly clear as to the method of lubricating the yarn, he should promptly ask for particulars, and while waiting for these he should let his laboratory have samples so that they may get him the details he wants without delay. When handling such a delicate fiber as rayon, the dyer simply cannot afford to run risks.

The use of soluble oil or Monopol soap is to be advocated in all these cases to replace or partially replace the Marseilles soap when there is any difficulty about the penetration of the dyes. Another point is that if by any chance the water-softening plant is not giving its full efficiency, the soaps formed by the hard water and soluble oil have not the same danger to the fabric.

There are authorities who recommend the use of soda ash instead of ammonia because it is so very much cheaper and only about 25% of the quantity is required. There is no disagreement with that; but—and it is a big "but"—where there is strong alkali, and rayon is being treated, there is danger. When the alkali is present, though it may be used only in very small quantity, there is risk of an accident somewhat on the lines of the following: The foreman dyer asked the man who had made and used the bath what he put in it, and after some argument the man said: "Did you tell me 2 ounces? I sure fancied you said 2 pounds." The discussion did not end there.

When the dyer has to color up hanks of yarn which are not oiled, there is no necessity for him to resort to any of the scouring methods that have been described. All that will be required will be to soak them very well in a liquor containing soluble oil for about thirty minutes, and then work them about in the bath for a further quarter of an hour; the liquid need not be warmed above 110° F. This will be found to give quite sufficient wetting to enable the dyeing to be perfectly level.

When goods have been scoured, by whichever may have been the best process, dyeing should follow immediately. The practice of drying the fabrics and keeping them in store for a time is to be deprecated, because that additional handling is bad for rayon and may cause very considerable damage to the fiber. There are quite enough troubles all the time without running any risk of adding to them; this cannot be too often repeated. The time of working should always be reduced to the minimum for proper effects to be obtained, and the handling in every case should be as gentle as possible; for the fiber, beautiful though it is, is far from being stout when it is wet, in spite of the great improvements that have been made in its production; and as it is valuable, every person who has a hand in the dyeing and finishing should be carefully instructed to treat it as such.

FURTHER PROGRESS OF AMALGAMATIONS IN THE GERMAN CHEMICAL INDUSTRY

Between Siemens & Halske A. G., Berlin, one of the two leading concerns manufacturing electrical goods in Germany, and Ruetgerswerke A. G., Berlin, a chemical concern specializing in the production of coal-tar products and derivatives, a contract has been concluded to form a new joint stock company with a stock capital of 18,000,000 marks. Fifty per cent of the stock capital is to be taken over by each of the two concerns involved. It is agreed upon by the two contracting parties that part of the shares controlled by Ruetgerswerke is to be taken over later by the Siemens concern, thus transferring the majority rights to Siemens, according to advice from the commercial attache at Berlin.

The new company is to manufacture exclusively the carbon products manufactured separately by the two concerns. All the carbon manufacturing plants of the two concerns of which the Ruetgers plant is located in Plania near Ratibor (German Upper Silesia) and the two Siemens plants located in Berlin-Lichtenberg and at Meitingen (Bavaria) will be taken over by the new company.

The production capacity of the Plania plant is estimated at 36,000 metric tons of carbon per year, whereas the capacity of the two other plants is not known, but is doubtless even higher than that of the Ruetgers.

The products manufactured by these three plants are carbon electrodes for electric furnaces and electrolysis, coal brushes for electric generators and electric motors, arc light carbons and other artificially made carbon for electrical purposes.

The Action of the Alkalies Upon Wool

Part III

A Review and Discussion of the Literature Upon the Action of the Various Alkalies Upon the Wool Fiber —Wool Damage and Its Detection—The Effect of Detergents on Wool—Ammonia in Wool Scouring—Hydrogen Ion Concentration and Wool Damage

By CHAS. E. MULLIN, M.Sc., F.A.I.C., F.T.I.

Professor of Textile Chemistry and Dyeing, Clemson College, South Carolina

(All rights reserved by author.)

DR. OLNEY, "Textile Chemistry and Dyeing" (1914), page 36, in discussing the action of alkalies on wool, says that "alkaline solutions in general have a noticeable action on wool, but the effects produced vary considerably according to their nature, concentration, temperature and period of action. Caustic alkalies—sodium hydroxide and potassium hydroxide—act injuriously on wool fiber under nearly all circumstances. Even when applied in cold and dilute solutions they act injuriously, and for this reason they cannot be used as scouring agents." He mentions that wool unions are sometimes passed through a concentrated caustic solution in order to mercerize the cotton present, but in this case the solution is always artificially cooled and the impregnated cloth passes directly into an excess of water. In the presence of soap the alkaline carbonates are not particularly injurious at low concentrations at temperatures below 50° C. (122° F.). Sodium and potassium carbonates tend to give the wool a yellowish color and a harsh, inelastic feel, while ammonium carbonate has a less injurious effect.

Seel and Sander, *Z. angew. Chem. 29*, 261-265 (1916), state that the injurious action of alkalies on wool is plainly visible under the microscope. The hydroxides are more powerful than the carbonates (which would certainly be expected on the basis of the hydrogen ion concentration), but ammonia is only perceptibly (microscopically) harmful on heating in fairly strong solutions. They illustrate the action of a 1% solution of sodium hydroxide on wool at 40 to 80° C. (104 to 176° F.) for fifteen minutes by means of photomicrographs. The different varieties of wool vary somewhat in their degree of resistance to alkalies. The initial indications of attack take the form of longitudinal striations due to a wrinkling of the epithelial scales, so that the surface of the hair assumes somewhat the appearance of a withered apple. This can be plainly seen under the microscope by focussing it sharply on the surface of the hair, otherwise the longitudinal arrangement of the cortical layer may lead to false conclusions. Water or glycerol jelly is the best mounting medium, as balsam and other mediums frequently more or less obscure the serations and markings on wool, probably due to a somewhat similar refractive index.

The wrinkling proceeds from a mere swelling of the scales to the formation of pronounced furrows as the attack advances and the temperature is raised. At 70° C. (158° F.) disintegration of the epidermis layer begins and at 80° C. (176° F.) the separation of the cuticle from the fiber layer is complete. Wool which has previously been modified by the action of alkali becomes extremely sensitive to attack by hot dilute sulphuric or other acids. The apparent striations which are observed in this case differ distinctly from the wrinkling produced by alkali alone. In alkaline dye baths they state that the destructive action of the caustic alkali may be avoided by the use of carbonates, hydrosulphite and ammonia; and that, with careful control, damage due to vat dyeing wool, even when followed by acid dyeing, need not be a frequent occurrence. They believe that in Germany much wool is damaged by the use of too alkaline solutions in scouring.

Knecht, Rawson and Loewenthal, "Manual of Dyeing" (1919), page 55, say that although wool is proof against the action of even moderately dilute acids, it is very easily acted upon by alkalies. The caustic alkalies and hydroxides of the alkaline earths are the most energetic in this respect. However, they vary in their activity according to the temperature and strength of solution. They continue that at 0° C. (32° F.) the action of even concentrated caustic alkalies on wool is very slight, but as the temperature rises their action becomes more and more intense, until at the boiling temperature wool is completely dissolved by prolonged treatment in a solution containing less that 1% of sodium hydroxide on the weight of the fiber.

They mention Depouily's crepe effect on wool or silk-cotton unions, which is based upon the shrinkage of cotton on treatment with sodium hydroxide solution. In this process the union is treated at 0 to 10° C. (32 to 50° F.) with about a 50° Tw. (Sp. Gr. 1.250) caustic soda solution for about twenty seconds, squeezed quickly, and neutralized in a cold 3 per cent sulphuric acid solution.

They do not believe that the alkali bound by wool is held as tenaciously as is acid; but in this they are probably wrong, as the ash present in wool is undoubtedly very largely due to the alkali in combination with the protein. The alkaline carbonates have some destructive action on wool, but this is much less than that of the hydroxides. As a rule, with the dilute aqueous solutions, such as are used in scouring and milling, and in the presence of soap, no injurious effect is observed; but it is well to bear in mind that their deteriorating action increases

with the strength of the solution, and more especially with the temperature. In a comparatively dilute solution of sodium carbonate wool is readily tendered, and by prolonged action is completely destroyed. The milder alkalies, such as soap, borax, sodium phosphate, etc., have much less action on wool. Borax is usually used where the wool is to be treated in a boiling alkaline solution, as in dyeing Alkali Blue. In dilute solutions, ammonia and ammonium carbonate are comparatively uninjurious. In alkaline solution wool is readily affected by metals, and for this reason wool which has undergone an alkaline treatment should never be brought into contact with metals before it has been thoroughly rinsed.

Georgievics, "Chemical Technology of Textile Fibers" (1920), adds little to that previously given in connection with the action of alkalies on wool. He states that lime is less harmful to wool than the caustic alkalies, but extracts sulphur (as also do the other alkalies) and renders the wool harsh and brittle, besides making it more difficult to full. "It is for this reason that tanner's wool is such an inferior material."

Detergents

Dr. Olney, *American Dyestuff Reporter 8,* No. 14, 11-16 (1921), says that at low temperatures the usual alkalies used in wool scouring have only slight deteriorating action upon wool; but as the temperature rises this action increases, and at a boiling temperature the combined action of soap and alkali is energetic enough to seriously tender the wool. At temperatures above 54° C. (130° F.) there is not only danger of felting the wool and of detracting from its luster and feel, but of seriously reducing its strength. Dr. Olney gives Fig. 5 showing the relation between the solvent and emulsifying power of a wool-scouring liquor and its effect on the tensile strength of the wool at various temperatures. The solid line represents the tensile strength and the broken line the cleansing action of the scouring solution. The percentages at the bottom represent the total tensile strength of the fiber, while the figures at the right represent the temperature of the bath.

It will be noticed that there is no great loss of strength in the fiber below 32 or 38° C. (90 or 100° F.), but above 38° C. there is a rapid loss of strength and above 52° C. (125° F.) the loss of strength is nearly a straight line. On the other hand, the scouring efficiency of the solution appears to increase much more rapidly at temperatures above about 40° C. 10(5° F.) than at lower temperatures. The two curves cross at 49° C. (120° F.), which temperature Dr. Olney believes to be best suited for the scouring of most wools.

Matthews, "Textile Fibers" (1924), page 157, points out that caustic alkalies should not be used on wool, even in neutralizing the free acids after carbonizing, and recommends either an ammonium hydroxide or dilute sodium carbonate solution for this purpose. Neither should be used very strong or above 60° C. (140° F.). He states that ammonium carbonate and borax have the least injurious action on wool, and that sodium phosphate may also be used without fear of injury. Potassium carbonate is believed to be less injurious to the fiber than sodium carbonate. He warns that if the alkali used in scouring woolen materials is not thoroughly rinsed out of the goods it may cause a deterioration and yellowing of the fiber on drying or storage. On subsequently dyeing these pieces they are very likely to be uneven, having streaks or spots where the alkali gradually accumulated.

Ammonia in Scouring

Schofield, "Wet Processes of the Wool Industry" (1924), page 44, states that ammonia is still largely used in wool scouring, but says that it is questionable whether this, as well as the use of potash in scouring, is not largely traditional and based upon the early use of urine, containing ammonium carbonate, for this purpose. He points out the high cost per unit of alkalinity by means of ammonia as compared to sodium carbonate, but is not sure that the action of the ammonium hydroxide is the same as that of the latter salt. He also calls attention to the possible judicious use of sodium hydroxide in wool scouring in place of the ammonia to obtain the benefit of the hydroxyl ion.

Ammonium hydroxide is a relatively weak base as compared with the corresponding sodium or potassium compound, as shown in Tables XLIX and L, and in a dilute solution is only about an eighth as strong as potassium hydroxide. However, it has not yet been proven that there is any direct relation between hydrogen (or rather the hydroxyl) ion concentration and detergent action or value. It is well known that the addition of a small amount of soap to a more concentrated solution of either sodium hydroxide or carbonate usually raises the hydrogen ion concentration (that is, lowers the pH value) of the solution slightly, even though it increases the total alkali concentration. That is, the addition of soap to the solution decreases its alkaline strength (pH value), even though it actually increases the alkali concentration, by retarding or buffering the hydrolysis of the stronger or more readily hydrolyzed alkali salt. Yet in spite of the actual decrease in alkaline activity (pH value, or hydroxyl ion concentration), the solution containing the soap, within the usual limits of concentration for detergent solutions, has a far greater cleansing action than that of the alkali solution without the soap.

Thus we see that there is no direct relation in most cases between the hydroxyl ion concentration of a solution and its cleansing or detergent value. However, if the "dirt" consisted largely or entirely of a saponifiable oil or grease, the hydroxyl ion concentration would again come into play, probably as the most important factor outside of temperature.

At the present time the whole theory of detergent action is so little understood that it is impossible to decide on a theoretical basis, in the presence of the usual number

of unknown factors, whether the use of ammonia in scouring is justified. Undoubtedly it is much easier and far more satisfactory to settle this by actual trial under plant conditions. Some plants use considerable ammonia in scouring wool materials, while others appear to obtain equally good results without it. Obviously the many other factors present in every case influence to a very large extent the results obtained.

Prof. A. K. Johnson, *American Dyestuff Reporter 14*, 875 (1925), reports that wool is completely dissolved in a 5 per cent solution of caustic soda at 82 to 93° C. (180 to 200° F.) on stirring for three to five minutes. Raw silk and Tussah silk were not completely dissolved under similar conditions in five minutes. Dr. J. F. X. Harold, *ibid* 877, suggested the use of an 8% caustic solution at the boil where complete solution of the silk is desired.

Farrell and Goldsmith, *J. Soc. Dyers and Colourists 26*, 195-202 (1910), explain that "the hydroxyl ions are the cause of alkaline reaction and, according to their concentration, of beneficent washing action or destructive solvent effects on the fibers treated with the alkaline solution. Sodium chloride solution contains positive Na ions and negative Cl ions; caustic soda solution contains positive Na ions and negative OH (hydroxyl) ions. Sodium chloride, although largely dissociated in dilute solution, has no detergent properties. The sodium ions therefore have no immediate detergent action, although they may play an important part in secondary processes.

"A 2 per cent solution of sodium hydrate (hydroxide) is dissociated to the extent of 80 per cent at 10° C. (64° F.), and therefore contains 0.68% of hydroxyl ions. A solution of sodium carbonate of 5% strength is dissociated into ions as regards 40% of the salt molecules,

$$Na_2CO_3 = 2\overset{+}{Na} + \overset{-}{CO_3}$$

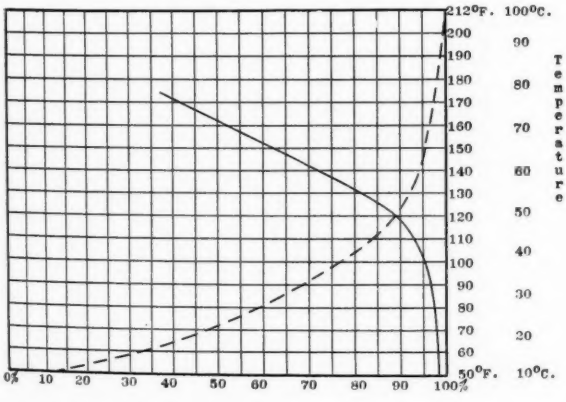

FIG. 5

Showing the Relation of Temperature of Wool Scouring Liquor to Loss of Strength by the Wool, and the Scouring Efficiency of the Bath.—Olney, American Dyestuff Reporter, 8, No. 14, 12 (1921).

"Hydrolytic dissociation plays a part here. It may be briefly described as the decomposition of the salt of a weak acid into free base and free acid or an acid salt. The active agents in this change are the free hydrogen and hydroxyl ions, of which water contains a minute proportion.

"The following secondary change takes place:

$$2\overset{+}{Na} + \overset{-}{CO_3} + \overset{+}{H} + \overset{-}{OH} = NaHCO_3 + Na + OH$$

That is, sodium bicarbonate and caustic soda are contained in a dilute solution of sodium carbonate.

"Two per cent of the sodium carbonate in a solution of the salt containing 2% is decomposed in this way by water: That is, a solution contains 0.04% of hydrolyzed sodium carbonate or 0.01% of caustic soda, which caustic is obviously dissociated. It is evident that the detergent actions of caustic soda and sodium carbonate are different. Nearly all the theoretical hydroxyl ions of the caustic soda solution are immediately available for attacking the 'dirt' *or the fibers which support it.*

"In the case of sodium carbonate, the hydroxyl ions which we have said are the primary detergent agents are largely in reserve; the comparatively small number of hydroxyl ions are in equilibrium with the undissociated and non-hydrolyzed salt and with the hydrogen and hydroxyl ions of the water. When the sodium carbonate solution is heated, there is an increase in the electrolytic and hydrolytic dissociations; more hydroxyl ions are set free until an equilibrium is reached for the particular temperature."

F. and G. state that if a fabric is "introduced into such a solution of sodium carbonate, the hydroxyl ions attack the dirt and fat present, and also *attack the fibers*, and therefore disappear, the equilibrium is destroyed, and in consequence hitherto undissociated sodium carbonate is resolved into Na and CO_3 ions, and these in turn react with H and OH ions (the water itself being disturbed in its electrolytic equilibrium), and fresh hydroxyl ions appear in the solution to continue the reactions with dirt and fiber. Sodium carbonate solution presents a case of automatically regulated dissociation and hydrolysis; sodium hydroxide, on the other hand, reacts at once to the extent of 80% of its available hydroxyl ions, even in cold solutions."

F. and G. continue their explanation of detergent action with a discussion of Spring's work, *Z. Chem. Ind. Kolloide* (1909), 161; (1910), 11, 109 and 164, on suspensions of dirt in soap solutions. The above is given not so much as an explanation of the theory of detergent action, which is really more or less outside of the field covered by the present papers, as an explanation of the destructive action of the caustic alkalies on wool and silk. Unfortunately, as previously mentioned, we have no one theory of detergent action which fully accounts for all of the factors involved. Undoubtedly both surface tension and emulsification

enter largely into any explanation of detergent action, but we are not sure that these are the only factors involved; and, as pointed out before, the hydroxyl ion concentration of a solution alone is no indication of its detergent action. However, it is the principal factor as regards its action on the wool or silk present.

Fort, *J. Soc. Dyers and Colourists 32*, 186 (1916), points out that the discoloration of wool in alkaline solutions is progressive with the duration of the dilute alkaline treatment. A certain amount of the fiber substance apparently passes into solution. He calls attention to the similarity in the effects of fading and alkali treatment of wool on its dyestuff affinity, and also the greater solubility of faded wool in alkaline solutions. After boiling wool in a dilute alkaline solution, it has an increased reactivity with potassium naphthoquinone sulphonate, which indicates the presence of more free amino groups. A previous sulphuric acid treatment, or stoving, tends to protect the wool from the browning action of weak alkali until all of the acid has been removed from the fiber.

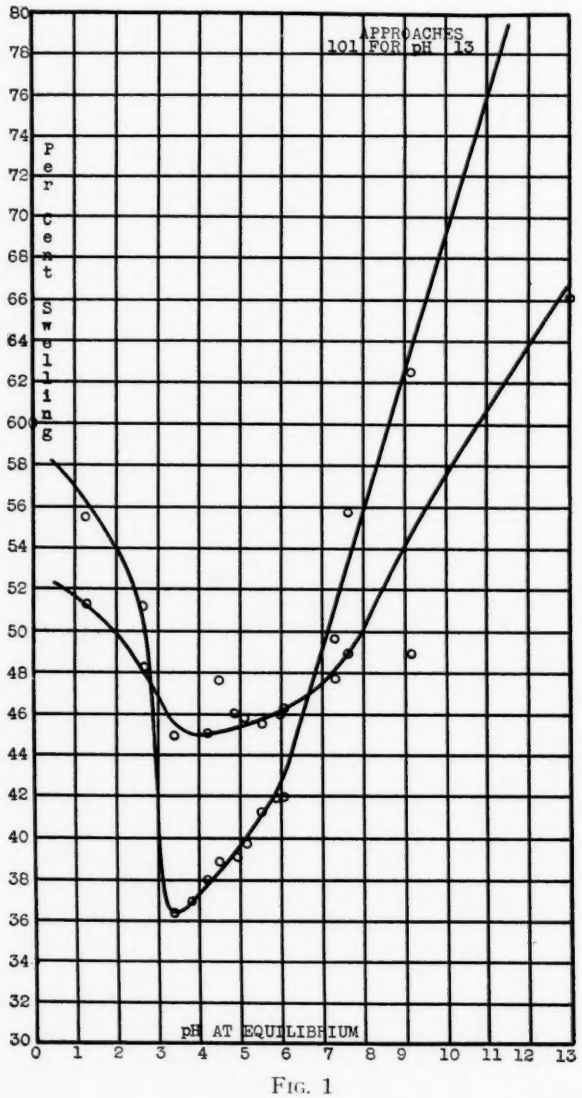

FIG. 1

A. O. Frostel, in United States Patent No. 1,371,951, March 15, 1921, proposes to improve the grade of coarse and more or less bristle-like hair, wool and furs, in regard to softness, spinning and felting properties, by treatment for from ten to fourteen days in a cold dilute milk of lime to which 0.2% by weight of an alkali sulphide has been added. It is then washed with water, treated for about twenty-four hours in a bath of hydrochloric acid of such concentration that 1% of acid remains in the bath after the alkali present has been neutralized, washed with water and dried. In view of the action of both alkalies and sulphides on the wool fiber, it is rather difficult to understand just how this treatment would improve the normal wool fiber. However, it may considerably soften the more bristle-like fibers mentioned above.

United States Patents No. 1,389,274 and No. 1,389,275 (German Patent No. 355,532) to W. H. Schweitzer, assignor to the Soc. "Technochemia" A.-G., August 30, 1921, cover the treatment of animal fibers successively with an oxidizing agent and an excess of alkali, and subsequent impregnation with waterproofing and softening agents. The latter United States patent specifies that the fiber is first treated with a large excess of an oxidizing agent, and then treated with a boiling soap solution, whereby the softness, luster and affinity of the fiber for dyestuffs is increased.

The solubility of wool in caustic solutions has been utilized in many industrial processes, such as the manufacture of certain laces upon a wool back-cloth, special gauze fabric effects, etc.; as, for instance, in British Patent No. 256,666 to H. H. C. Wilcock, which covers the production of figured gauze fabrics, etc. A leno or other fabric is woven on a one-shuttle loom with a multiple filament weft comprising material which is not susceptible and material which is susceptible to the action of a solvent or agent in a subsequent carbonizing process; for example, cotton in combination with silk, wool or acetate silk. Thus, one fine cotton thread and one coarse wool thread are wound on the same pirn so as to be introduced at the same pick, but not twisted together. A colored pattern is printed on the fabric and the fabric is carbonized at the unprinted or ground part, as by treatment with sodium hydroxide solution, by the aid of a roller engraved with the ground part. The susceptible material (wool, etc.) is destroyed in the ground part, leaving a comparatively heavy printed portion on the gauze or net ground. The resulting material resembles a "Madras" fabric.

(Part IV will appear in an early issue)

Increasing the Production of Cotton Padders*

The Conditions as Found—Analysis of Delays—Developing the Plan and Selling It—Installation—The Wage Incentive—Eliminating Excess Labor—Breaking in a New Machine—Results

By REYNOLDS LONGFIELD

Industrial Engineer, Bellman Brook Bleachery, Fairview, N. J.

When floor space becomes cramped and production throttled in certain departments of a growing business, the management is confronted with the task of enlarging capacity.

The author discloses the procedure followed in the dyehouse of a cotton-finishing plant for increasing production per man-hour and per machine-hour without investment for additional equipment.

He describes the psychological background and existing handicaps, and outlines methods of overcoming both with results of noteworthy improvements.

EVERY cotton-goods finishing plant has, at rush times, experienced the annoying problem of putting a sufficient amount of material through one or more departments. In the course of changing business, no finishing plant or organization can be made like the "wonderful one-hoss shay"—a finished and homogenous whole, perfectly balanced and all parts equally serviceable and functioning as planned.

Consequently, as the rush of business begins, the strength of the entire chain is measured by its weakest link. It is realized that there is a bottle-neck effect, and that work piles up in front of certain processes. Even then it is doubtful if the extent to which production on other operations is curtailed can be fully comprehended.

The usual old-fashioned method of overcoming such a condition is to enlarge the department by providing more floor space and placing additional equipment—frequently requiring large outlays of money. Spending money, unless warranted, is attempted suicide. One of the foremost principles advocated by the late Henry L. Gantt was to refrain from enlargement until maximum production was obtained with equipment in use, as determined by a thorough, scientific investigation.

In this paper a practical example is given showing certain conditions in one of the departments of a cotton-goods bleachery, how the problem was approached and worked out, and the results obtained.

It had been necessary to operate the direct-color padders considerably overtime during the busy season because of lack of space and equipment. The engineering department had included in its program a plan to study the operation of these machines for the purpose of determining what should be done. This work was started at once, hoping that methods might be developed whereby overtime at least could be entirely eliminated.

The foreman was of the old school—a good color man of considerable experience who took a personal pride in the appearance of his department, the quality of his work, and the welfare of his men. He had asked for task and bonus in his department, saying that he did not believe any increase in production possible, but that he was anxious for his men to receive pay on a par with the best-paid workers in the plant.

He was assured that the management would pay a bonus based on a task of what would be considered a fair day's work regardless of existing production, such task to be determined by means of a thorough and detailed analysis of operations. If these studies showed that, by means of mechanical applications or by different divisions of labor, increased production would result, he would be asked to install them.

To all this the foreman readily agreed, and investigations immediately started.

Conditions as Found

The following will give a brief outline of conditions found in the department:

1. The material was received from the dry cans, plaited into box trucks of approximately 400 yards each. The padders pulled directly from these boxes and delivered in 1,000-yard rolls for drying.

2. The machine layout was good (Fig. 1), the padders being arranged in a good light on one side of the room, while the boxes containing work ahead were stored on the other side. Each machine was equipped with two 150-gallon tubs so that dye solution could be prepared in advance in one tub while the machine was drawing from the other.

3. The padders were so designed that when batching on a shell it was necessary, each time the machine was started, to give the shell a turn in order to overcome its inertia. The starting lever being on the entering side, the helper had to be on hand at the take-off side to give the roll the required twist when the operator was ready to start.

4. The organization, together with the duties of the various individuals briefly outlined, was.

One second hand. Supervising
One drug man. . . Weighing out ingredients for dye bath

*Presented at the First National Meeting of the A. S. M. E. Textile Division, Boston, Mass., May 22, 1928.

Two floor men...	Supplying cloth as planned by foreman
Eight operators...	Running machines
	Washing machines
	Washing tubs
Eight helpers...	Getting dye solution
	Assisting in starting rolls
	Assisting in removing rolls
	Delivering complete work for drying
	Drying patches (or swatches) at tenter frames
	Taking patch for foreman's approval before proceeding with the dyeing of the lot.

Analysis of Delays

After a brief survey, it appeared that the machines were producing at nearly full capacity, but considerable idleness of man time was evident. The real problem, however, was to increase production per machine-hour before considering output per man-hour. Consequently, care had to be exercised that man time should not be filled to the extent that poor service would result in machine delays. Accordingly idleness was considered in two groups:

Group I.—Machine delays, the elimination of which would increase production per machine-hour; and

Group II.—Idle man time, the elimination of which would increase output per man-hour.

Under Group I, machine delays were listed as follows:

1. Incorrect speeds of machines. No two machines were running at the same speed, although a definite speed had been established for each class of goods.

2. Washing the tub. The operator did this, permitting the machine to stand idle while doing so. If another were designated to wash the tub while the machine was still in operation, the time thus saved would mean more yards by the end of the day.

3. Waiting for the dye solution on every shade. This resulted because the helper always delivered the final roll before obtaining the color for the next shade.

4. Patches were dried at the tenter frame. The walk there and back required a great deal of time, considering that there were a hundred or more patches each day. A patch drier would eliminate this.

5. Miscellaneous delays resulting from lack of interest in the work were frequent. It was believed that a wage incentive would minimize these.

Under Group II, in the analysis of idle man time, it was found that the delays were numerous, variable in length, and difficult to classify. One man frequently waiting for another indicated poor distribution of labor and lack of co-operation.

Developing Plans

In view of this it was decided to classify the duties rather than the idleness of each man, and to plan a new distribution of labor to a new type of organization. The padder being the basis of work, the operation should center around it. The principal duty of the operator should be to keep it producing, machine delays as classified in

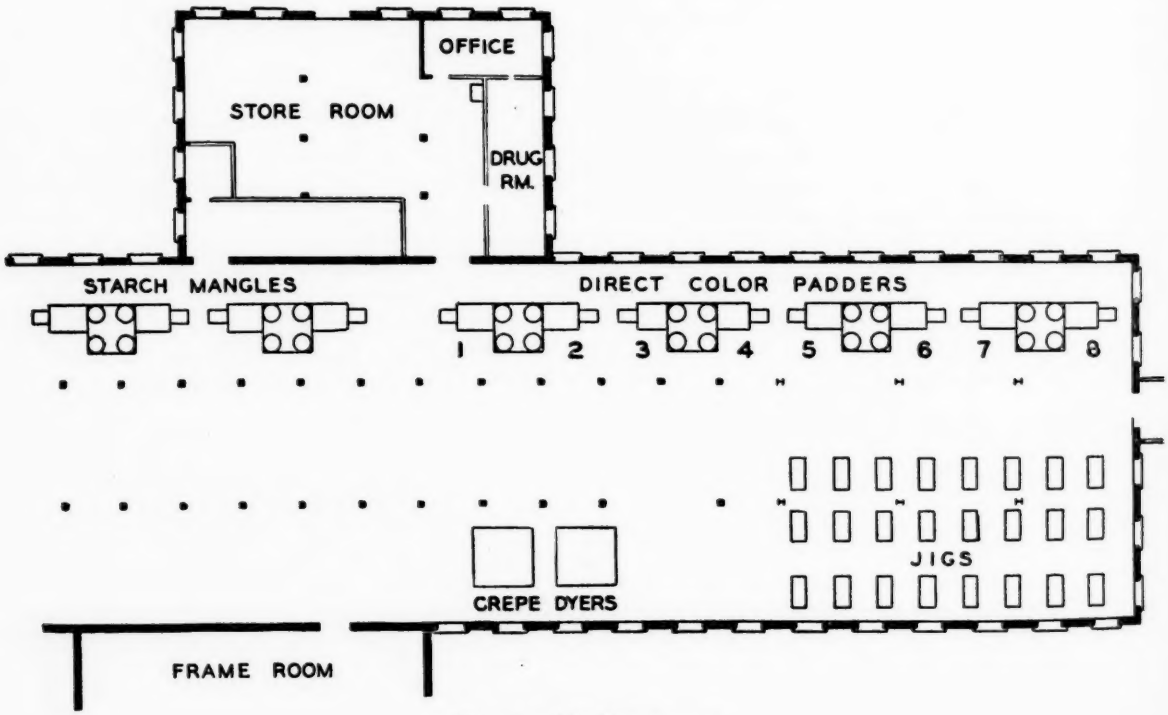

Fig. 1.—*Machine Layout*

Group I being avoided. Then, in order that the operator might work efficiently, all idle time had to be eliminated and a full-time job laid out for him. To do this, conditions had to be such as to make him as independent of the rest of the organization as possible. Those supplying the machine with materials had to do so in sufficient time to permit him to have all material when wanted; and all joint operations which required the assistance of others had to be altered so that they might be performed singly.

The following duties were those wherein he was jointly or entirely dependent upon others:

1. Supplying of goods to be dyed.
2. Supplying the dye solution.
3. Delivering the finished work for drying.
4. Drying the patch and having it approved.
5. Starting a roll.
6. Removing a finished roll.

For the first three of these, the operator was entirely dependent upon others; but with good supply men and truckers the work could be planned so that there would be no delays.

Fourth, drying the patch and having it approved had always been done by the helper, while the operator, with nothing else to do, sat down and waited for the foreman's authorization to proceed. There was no doubt that the more responsible operator would do it more quickly if this were required of him.

Fifth, the helper always assisted in starting the roll because the starting lever was on the entering side of the machine and it was necessary for someone to be on the take-off side to give the roll momentum. The solution was simple. It was only necessary to put an additional starting lever on the take-off side, so that the operator had but to start the next roll from the same position as where he had removed the last.

Sixth, removing the roll. A thousand yards of wet cloth on a roll was heavy, and it seemed that assistance here would be necessary. The machine was so constructed that if the roll were not removed carefully, it would hit the side and fall to the floor. The aisle did not permit room for extension arms and the problem was annoying. Finally, the idea was conceived of placing a mechanical hand in the form of a support to hold one end of the center bar while the other end could be swung slowly and carefully out over the aisle and the roll thus lowered to the truck, and there left for the trucker to deliver for drying.

Accordingly all plans were laid to operate the padder without a helper. Four of his duties were to be performed by the operator; namely, drying patches, having patches approved, starting a new roll, and removing the finished roll. There remained the supplying of dye solution and the delivering of finished rolls for drying. It was evident that not only were helpers not needed, but that their remaining duties should fall into two distinct jobs: trucking and supplying dye solutions; and to these should be added that of washing the tubs.

This in general took care of the principal operations, but a number of minor details had to be worked out, such as the making of roll tags, labeling of buckets, adding of steam pipes, and labeling of the same to prevent confusion. Each of the smallest details was noted and given its place in the organization so that there would be no chance of any two conflicting. Finally, it was confidently felt that nothing had been overlooked and that the scheme was correct.

After the type of organization was planned it was necessary to determine the number of men required for each of the several operations. Since this had to be done accurately, scientific time studies were made. However, after the careful analysis that had already been completed, very few time studies were necessary; a very definite idea had been reached as to the number of men needed, and it but remained to check all plans.

The organization then appeared on paper as follows:

One second hand.
One drug man.
One floor man.
One trucker.
One color man.
One cleaning man.
Seven operators.

This arrangement would release:

One floor man.
Five helpers.
One operator.

These transferred to other departments one at a time and the remainder paid a bonus of 20 per cent would call for the following results:

Increased machine capacity, 20 per cent.
Reduction in working force, 35 per cent.
Increase in pay to men, 20 per cent.

Selling the Plan

Up to this point, all plans were based entirely on observation. They were strictly plans of an official observer, having been developed in about a month's time on the job. But, of course, it is one thing to plan such changes and another to put them into effect with as little upset to the organization as possible. It was well realized that the greatest caution would be required to maintain the morale of the men.

The best feeling existed at the time, however, and skepticism had practically disappeared. Nothing definite had been discussed with the foreman because there had been nothing definite to offer. The men realized that the intention was to increase their pay, and that such increase would be based upon the amount of work produced. The older and more serious minded welcomed the idea. Only those who habitually soldiered were annoyed, but their

attitude carried no weight with their fellowmen. It was felt that the proper attitude had been developed in the department, and that all plans were well laid.

Then one day the foreman was invited into the office for the purpose of discussing the work as laid out for the padders. The scheme was briefly outlined and he was told in as few words as possible the method of proposed procedure—that the machines would be equipped with two or three mechanical appliances in order that the operator could work independently of others, that an extra man would wash all tubs for the machine operators in order to increase running time, and that the operator would deliver his own patches for approval rather than sit down and wait for the helper to do it for him. He grasped the idea immediately and proceeded to ask questions concerning the minor details. The problem had been thoroughly worked out and he was given the answer to every question; but it was evident he had not been convinced. He had confidence in his organization and was reluctant to make any change. He was fearful that production would be curtailed rather than assisted, and that demoralization would result. To convince him that there would be no chance of disrupting the organization, he was told that the operation as planned would be worked out on one machine and later extended to the others.

Installation

With this method of procedure agreed upon, one machine was selected. The operator was a husky Italian of middle age, father of seven children, and a worker rather independent of the rest. His term of service was not as long as most of the otners, making it probable that he would be more adaptable. He was told that a bonus had been worked out for the job, but that before it could be paid alterations would be necessary both on the machine and the operation itself.

He accepted this with an open mind. It was known throughout the department why these investigations had been made, and that such work had been going on in another department where men had increased their pay 10 to 15 cents per hour. Therefore, if the opportunity were offered him, he would be anxious to try—"provided," he interposed, "it would not be necessary to work too hard."

The mechanical department started immediately to equip the machines according to instructions and drawings which had been prepared in advance. The illumination was improved, a better type of yardage clock installed, and the extra starting lever placed on the take-off side of the machine without having any noticeable effect upon the attitude of the employees. But when the one-man take-off neared completion, the various operators became appreciably annoyed. The man upon whose machine the work was in progress protested. One thousand yards of wet cloth were heavy and all that *two* men could handle—it was entirely out of the question for one man to handle a roll without assistance. He was good-naturedly humored and advised to wait to see how it worked.

Finally everything was in readiness. No change in methods had been requested, for it was evident that, first, the minds of the various men should be put at ease with reference to removing the rolls. The machine was supplied with dye solution and material, and started up as usual. At the completion of the first roll, all members of the department, including the foreman, curious as to the outcome, gathered around to see the result of the demonstration.

The designer of the apparatus, a member of the engineering department and a man of slight stature weighing about 140 pounds, stepped forward and grasped the center bar. With one hand he swung the roll from the machine and to the truck with no apparent effort. It was now easier for one man than it had been for two prior to the changes. The operator, a big 180-pound Italian, grinned sheepishly and returned to his work. For a long time afterward he would permit no one else to remove the roll, always insisting upon performing the operation himself.

The machine was now equipped to permit the elimination of idle man time. These contrivances were applied first, that the operators might have ample time to get used to them, and to some extent they were immediately adopted, although no requests had been made, it being necessary to do away with machine delays first. Accordingly, the machine delays were taken up in the following order:

1. All materials were classified and the correct speed for each class of goods determined. The starting box on each machine was then marked to show where the switch should be located for the proper speed, and the foreman was required to designate the class of all goods delivered.

2. The tub was washed by an extra man whose duty it was to come immediately on signal from the operator when the last of the dye solution had been drawn.

3. Dye solution was prepared in advance and the helper's principal job was to see that it was in the tub before the operator was ready for it.

4. A patch drier was built. This was an elaborate affair with controls on heat, draft, and circulation permitting an exact duplication of conditions on the tenter frames. The foreman not only approved but became quite enthusiastic over its operation. The walk to and from the tenter frames was not only eliminated but the actual time of drying the patch was cut in half.

5. Miscellaneous delays were then approached through personal attention. The foreman was asked to require the drug man and floor men to give this machine the best of service. Each delay was noted and approached from its own particular angle, until there remained only the wage incentive to do the rest.

After devoting a few days to perfecting the service and reducing all machine delays to a minimum. The operator in the absence of his helper had learned not to wait. He had found it just as easy to start the roll. run

a thousand yards, and remove it without assistance, sometimes even with the helper standing by and watching. However, when the patch was taken to be dried and then carried to the office for approval, the operator always found a nice, soft place to sit down and wait. The foreman had been asked to change this policy and require the operator to make this trip to the office for the purpose of getting closer contact and receiving all instructions at first hand. But the foreman considered it inadvisable in view of the fact that it had always been the method in the plant, and that he had never seen it done otherwise. Nevertheless there was no other solution, and in order to maintain equanimity it was necessary to approach the problem from another angle—that of dollars and cents.

The Wage Incentive

The wage-incentive plan in effect in the plant was the regular Gantt task-and-bonus, allotting a definite time for a job. If accomplished in the time allowed, or less, the man's hourly rate was increased and he was paid for the full time allowed.

On the padders, this worked out simply. The task allowed was 0.2 hour per 1,000 yards, and 0.2 hour for each patch. The man's hourly rate was 50 cents. A bonus of 20 per cent then amounted to 10 cents, giving a total wage of 60 cents per hour for accomplishing task.

With these figures it was simple to explain to the operator that he was to be paid 12 cents for each 1,000-yard roll produced and 12 cents for each patch submitted, provided that he maintained an average of five rolls and patches per hour while on bonus.

It is always easier to explain it in some such easy way at the start, but invariably the average employee learns the regular method of calculating bonus in a short time.

It might be well to say here that any delays which are not the fault of the operator, such as those resulting from machine repairs or waiting for material, are deducted. This enables a man to make bonus for half a day or less, provided he maintains the required speed while working.

All delays are called to the foreman's attention at the time they occur, and he is also given a daily report of the lost time balanced against the operating time. It is up to the foreman to eliminate these waits as far as possible, and if at any time he finds that idleness in his department is totaling ten hours a day or more, he realizes that he has in operation at least one more machine than necessary. Consequently, the foreman finds himself between two fires. The operative, realizing that delays may cause him to lose bonus if no deduction is made, seeks credit for each wait. On the other hand, the foreman, subject to criticism from the management for excessive idleness, must maintain conditions to eliminate these waits.

In a department not working on such a plan, it is impossible to get a correct record of either machine- or man-hour delays.

Starting the Task

On the day that the task was to be started, the operator on the experimental machine was approached before starting in the morning. He knew the general task-and-bonus plan, having talked with men from the other departments who had been increasing their daily wage. He did not know how hard this particular task was, but he was anxious to receive more money and was willing to try. When told that he would be expected to dry his own patches and take them to the office for approval, he asked what the helper would be doing. It was explained that at present there was nothing, but since the operator was to receive the bonus, he should dry the patches. The result was not surprising, for the handwriting on the wall was plain—in fact, rumors had been current for some time that some helpers would not be needed—the man parried and sidestepped. He argued that the operator had never dried the patch before; why, now, should he start it? It would add considerable work, and besides others would criticize. He was told that the management paid bonus on work done and it would be out of the question for him to expect bonus on idle time, but all to no avail. He seemed immovable, apparently affected by what others would think. The man was of the type that did not care for the opinions of others as a rule; but this seemed like asking too much and it was decided to lay off for a time. However, it was still believed that an entering wedge could be driven through the pocketbook, for he had a large family and needed all extra money possible to get. In order not to embarrass him and yet give him the chance to see that the task was fair and the bonus liberal, it was agreed that temporarily he need not dry the patch, but the time he waited for the helper to do it for him would be considered as idle time. Should he decide to carry the patch, he was assured that he would receive credit for it each time that he did.

The scheme worked as planned. At the start he earned between 80 cents and a dollar a day extra. Soon he began experimenting, first to see how much he could learn, and then to see how easy he could work and still receive bonus. He dried a few patches and then a few more. Finally it dawned upon him that he was letting 20 or 25 cents a day slip through his fingers. Before two weeks had passed he was doing the task as laid out, and apparently without criticism from others. By this time several had asked for bonus, and one had gone so far as to dry all his patches to show willingness to do as requested.

The morale in the department was not at its best, but it was vastly improved and was considered satisfactory. Task and bonus had been applied on one machine for three weeks and had worked out to the satisfaction of one man. Others wanted it, so it was decided to go ahead with the work, and the mechanical department was given orders to equip all machines. As fast as they were put into shape the op-

erators were offered bonus, and by the end of the week all machines were performing the task.

The work of improvement had gone surprisingly far in view of the fact that more obstacles had been encountered than were expected. It had been planned to have the operation running smoothly by the time the peak load was reached, that production might not be limited; and this had practically been accomplished. Now, with the busy season at hand, all operators were working under the new conditions and the padders were not only producing the same number of yards as in the previous year with one less machine and without overtime, but upon an examination of reports for over a year previous it was found that a record week of production had been completed.

Eliminating Excess Men

Although the bulk of the work had been finished, there was considerable yet to be done. Results so far had been obtained by keeping the machines in operation with little attention to idle man time. True, the operators had been given full-time jobs, but this had been accomplished by appropriating duties of the helpers, thus exaggerating their condition and leaving them but little to do. The two floor men also were finding it difficult to look busy, their principal work being to keep lots straight.

Accordingly one floor man and five helpers were transferred to other parts of the mill, retaining the senior floor man and three most likely helpers with duties apportioned as follows:

Floor man, to supply goods in proper order.

Color man, to supply the dye solution.

Trucker, to supply shells and deliver rolls for drying.

Cleaning man, to wash tubs and assist others where possible.

For performing these duties satisfactorily they were each to receive 15 per cent of the total bonus paid to the operators. If an operator lost bonus, the bonus paid to the service men automatically became proportionately smaller. This plan was used to develop a spirit of co-operation. Becoming vitally interested in the production of the machines, they not only did everything to help the operators but helped each other as well.

Breaking in a New Machine

Finally the new type of organization with the new distribution of labor was in operation as planned—not yet a perfect running machine but a well-designed one. All machines had to be broken into use gradually no matter how well put together, and this one did not prove the exception; it still needed the rough edges worn off. And in addition to being worn in, it had to be equipped with meters and gauges in order to check the performance at all times and record bad conditions.

Although the organization was doing good work, each and every man, including the foreman, was on a job entirely different from the one at which he had served for years. Machine delays were entirely too frequent. The color man was frequently late in delivering the dye solution, and the floor man had difficulty at times in getting the next lot. They had not learned the best way of handling their work. Time would have improved this, but best results would never have been obtained without proper records and control.

To furnish these, a daily report was drawn up for the foreman, giving the record of each man as to work done, bonus earned, of idle time and why. When these reports first began to appear the foreman could not believe that such idleness was actually occurring, and made it a point to check each and every one. Finally becoming convinced that his department was totaling more than ten hours a day of machine idleness, he realized that he was operating with more machines than were necessary. On short notice he cut off one machine and made a drive on the service men to eliminate all delays.

Results

Here the department is left with the feeling that it is in first-class condition, although not a finished product, for a year's operation at least will be required before conditions and operations are running as smoothly as desired. And always the engineer will receive the same daily report which the foreman receives, that he may know if conditions are improving or retrograding.

Here a brief survey of records is opportune in order to determine, by comparing data obtained prior to the change with that of the new organization, if results have come up to expectations:

Average daily production per machine: Prior, 20,100 yards; present, 27,500 yards; increase, 36%.

Average daily wage per man: Prior, $4.55; present, $5.70; increase, 25%.

Average unit labor cost: Prior, $0.072; present, $0.052; decrease, 27½%.

Annual reduction in labor cost per 100,000,000 yards—$20,000.

Also, it would be interesting to note conditions pertinent to the quality of performance. Maintenance of quality is strictly a function of the foreman, and the following conditions afford him greater opportunities to this end:

1. The best men were retained when the excess help was transferred.

2. Competitive concerns must raise their bids considerably in order to entice the skilled help.

3. A higher grade of employee is being obtained because of the higher wage.

4. Operators watch their work more closely in order to avoid difficulties.

5. There is less distraction in the absence of men with nothing to do.

The data presented here to show results in connection with quantity and quality production, together with increased capacity and lowered costs, are very conservative. As time goes by and wrinkles are further smoothed out, the figures will appear even more favorable.

Conclusion

The problem has not been that of a dyehouse alone, but is typical of what occurs in many departments in every finishing plant. However, an organization of this type, where the duties of its various members are functional and its success depends strictly upon cooperation, seemed particularly applicable in this case. It is not recommended for all dyeing departments, for conditions vary widely throughout the textile industry, but an average set of conditions found in an average department has been cited.

But when conditions are cramped, the flow of work is throttled, costs are high, or capacity is limited, unless the department has been thoroughly analyzed by one who has the time and experience, there is every reason to believe the company is throwing away money. If the stage has been reached where the purchase of new equipment or floor space seems necessary, it is strongly recommended that a scientific investigation be made before laying out the money.

Practical Hints on the Production of Bright Colors on Textile Fabrics

Part XXXV

The Acetate of Alumina Processes—The Equipment and Its Operation

By RAFFAELE SANSONE

ACETATE of alumina is sometimes employed for dyeing cotton with basic colors, and through its means very bright shades can be produced. Also, the material acquires a certain weight and "feel" not unlike that of Turkey Red dyed goods. Several processes are at present at disposal:

1. The old process, based on the use of several separate baths.

2. The slop padding process, based on the use of pastes containing both the mordant and coloring matter, and

3. The printing process, based on the production of the very brightest effects.

The old process finds some use in treating the heaviest kinds of goods, with which penetration is more difficult. In this case the properly boiled out and bleached cotton fabrics are impregnated with an acetate or sulphacetate of alumina mordanting bath measuring from 4 to 6° Be., dried at a moderate temperature which should exceed 60° C., passed through a bath containing one part of 50% Turkey Red oil for every ten parts of water, and again dried at 60° C. After the above treatment, the material is dyed in a fresh bath containing one, two or more basic colors in accordance with the shade to be produced, until the required intensity has been reached.

When treating small lots of material the impregnation with acetate of alumina, the treatment with the Turkey Red oil and the dyeing operations can be carried out to advantage on a series of jigs such as that illustrated in Fig. 1.

Here are to be seen four strong iron vats A, B, C, D, of triangular shape, and sustained by trapezic iron sides set firmly in the floor of the plant. These vats are lined with a thick covering of very resistant enamel having a very smooth, easily cleaned surface. At the bottom is a large opening leading in each case to a copper tap, which serves for discharging the different baths, either into lower cement collection cisterns, or directly into the waste water main. The upper portion of the frame sides contains the usual driving movement, worked by the fast and loose pulley P, with arrangement for reversing the direction of the upper rollers in each jig. Above these rollers are placed others of India rubber, which press the material continually while it is being rolled between pairs of wooden beams held on iron arms. In

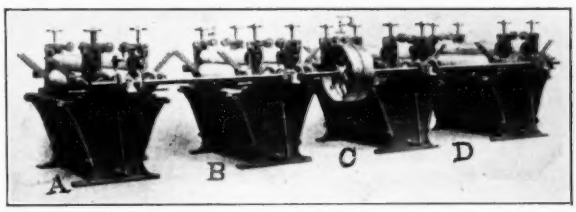

Fig. 1

this way the quantity of treating fluid left in the cloth is regulated in every case to a fixed content. The pressure arranged as above on the eight pairs of squeeze rollers is applied by upper hand screws. Vat A is intended principally for treating with the aluminum acetate bath, vat B for treating with the Turkey Red oil (sulphonated oil) bath, vat C for rinsing after the dyeing operations, and vat D for dyeing with the basic dyestuffs.

The four jigs contain two lower and three upper binding rollers of copper-plated iron, glass or porcelain, by means of which the fabric is made to descend twice in the baths of treatment, assuring an easier and complete impregnation. The two lateral upper rollers serve principally to keep the material at a certain distance from the central roller, which is covered with it for one-half. Every binding roller has, near its ends, a pair of shallow grooves. These remain at a good distance from one another, and always above the width of the widest piece to be treated. Such grooves serve to keep apart the strings used for the introduction of the cloth. Copper heating coils are furnished in jigs A, B, C and D, which remain just about one inch below the two lower binding rollers, and there is no danger that the fabric can come in contact with them during its passage above. Water, heated by steam or other convenient means in a special boiler at the back of the plant, is circulated in the coils when necessary. The coils receive and deliver the hot water by tubes and taps crossing one of the supporting frames on each jig.

Suitably placed taps allow a rapid filling of the jigs with clean cold water whenever rinsing operations are to be conducted, whereas, through a special arrangement, all jigs can be worked simultaneously from the fast and loose pulley P, or only one at a time may be necessary.

Operation of the Plant

To start work on the above plant, after thoroughly cleaning vats A, B, C and D, four pairs of strong cotton tapes are entered between the squeeze rolls on the left, brought around the first binding roller at the bottom, carried above the central upper binding roller, brought down again to pass around the last lower binding roller, and carried over the third upper binding roller and through the nip of the pairs of squeeze rollers on the right; care being taken that the strings remain all through this operation in the grooves already indicated, that is, at some distance from one another.

When the cotton strings have been entered, the openings on the bottom of the four vats are closed, and the bath of acetate of alumina is introduced before passing the hot water through the heating coils. A first lot of four rolls of the properly boiled-out and bleached cotton cloth is then entered before the squeeze rollers on the left, and to them are tied the beginnings of the cotton strings already present in the machines, while the ends are fixed to wooden shafts which press against the lowest unit of the squeeze rollers on the right.

Pulley P is then started to pass the material in a fully spread condition in the first bath of treatment, where it is rapidly impregnated and pressed continually between the nip of the rollers on the right, behind which it forms new rolls on other wooden beams. As the ends of the first rolls are approached, the machines are stopped and the first are tied to other pairs of cotton tapes, the ends of which are fixed to the wooden beams, which remain empty in this case. When such strings pull later on the beams, the movement of the rollers is reversed and the cotton cloth passes again on the wooden beam from which it was unwound. In the meanwhile, hot water has been run through the copper coil at the bottom of vat A, B, C, D, and the return course of the material takes place with a bath warmed between 40 and 50° C. Two ends are made to follow after this at the higher temperature. When all the material has run on the last wooden beams which have to receive it, the plant is stopped and the cotton strings are rapidly detached, keeping them in the jigs for a second treatment. This is made to follow with a fresh bath of acetate of alumina, the old bath being stored away for reinforcing when cold for using again.

In the meanwhile, the first rolls of cloth are carried to another department of the works to be dried at

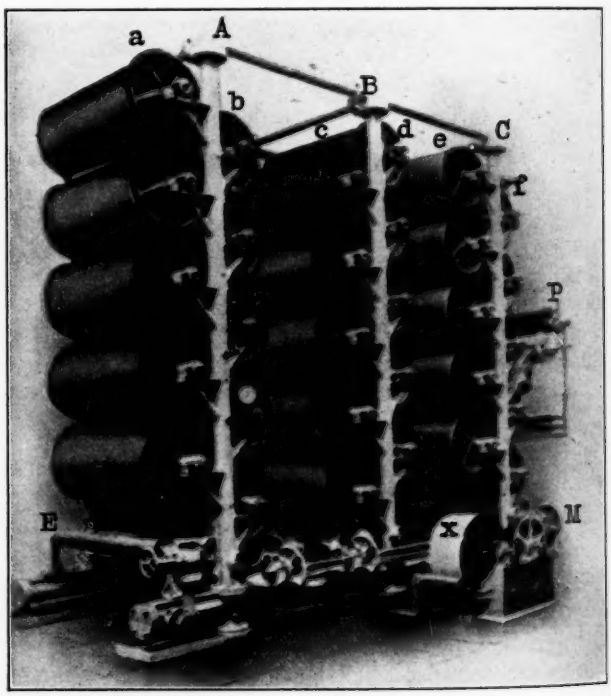

Fig. 2

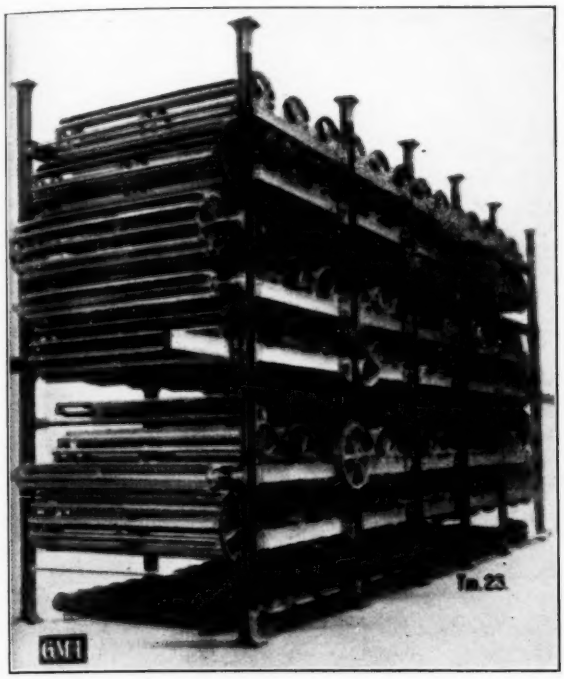

FIG. 3

60° C., and loaded on trucks ready for further treatment. They are followed by a second, third, fourth and further lots until the whole batch has been dried, after which vats A, B, C, D are freed of the last bath of acetate of alumina and well washed with clean water. The first bath of Turkey Red oil is introduced, this carrying out the treatment of the first four rolls of dried fabric, which are carried again to the drying department to repeat the heating operations; later lots being made to follow after this on the jigs until the whole batch of aluminum acetate mordanted cloth has been treated and dried. After this the jigs are used for dyeing with the basic colors, and for a thorough rinsing with water. The various batches are then conducted a third and last time to the drying department, to be prepared for the calenders.

THE DRYING OPERATIONS

The drying operations required for the above process cannot be conveniently performed on the ordinary roller drying machines, unless these are heated with hot water, the temperature of which is not allowed to exceed 65 to 70° C. Most of the machines available in the dyehouse are not large, requiring several passes in this case, with resulting extra expense for steam, labor, motive power, etc., and lower production. A cylinder drying machine such as that shown in Fig. 2 would give better results.

This figure shows three pairs of uprights A, B, C, fastened at the bottom to a strong iron frame, and at the top by several iron tubes. The uprights are hollow, and inside them is circulated the hot water serving for the heating operations, which is prepared in a copper-plated iron boiler at the back. The hot water is entered through a large tap, which is connected directly with the first upright, and makes its way out through another tap of equal size placed on the furthest upright at the back of the plant. A pressure gauge on one of the front uprights continually controls the conditions in the interior of the uprights, and in any other portion of the plant fed with hot water. Each upright contains ten short brackets, each furnished with a bearing for one of the short end-shafts of the drying drums. These are so arranged that the hot water is fed by their means to the drying drums, and while they are turning, without any leakage taking place in any portion.

The thirty drying drums are placed in such a manner as to form the six different series of five indicated by a, b, c, d, e, f, on each side of the three pairs of uprights A, B, C. All drums contain a large cast-iron pinion wheel on one side, serving for their rotation and the series a, b, c, d and e, f are moved by three lower pairs of small pinion wheels, one-half of which are keyed to a long steel shaft M, worked by a large pulley x, driven from an upper transmission. This is furnished with a friction clutch, with which the plant can be started or stopped by the simple turning of a small handwheel.

The drying drums are constructed of strong iron sheeting, carefully copper-plated on the outside so that no soiling can take place through the formation of rust. They are large in diameter, and a considerable surface of heated metal is exposed against the cotton fabrics being dried. Besides this, the round shells of the thirty drums are closed by spherical entrance plates, connected directly with the short end shafts supporting the same, and entering the hot water from the uprights.

On the front of the machine is a device E, often composed of several rollers, of stretching bars, etc., while at its back is a perfected folding arrangement worked automatically by the power driving the rest of the machine. At the back of the plant is a special device by means of which the dry cotton cloth goods can be rolled on to the wooden beams, as required for treating with the jigs illustrated in Fig. 1.

A light iron frame is generally fitted in front of the machine for entering the cotton fabrics from wooden beams. The cloth enters in this case on the lowest of the first ten drums a, b, and passes upward on these in zig-zag fashion until reaching the uppermost on a, to pass from here directly to the uppermost drum of the second series of ten drums c, d, and downwards with a zig-zag course until reaching the lowermost drum and passing to the closest bottom drum on the double series e, f, and descending from this right

to the beam rolling arrangement, or to plaiter P to be formed into pieces.

In some mills the above described plant could be substituted by another constructed on a different principle, as shown in Fig. 3, by the Waggon und Maschinenbau Akt. of Goerlitz. In this two pieces of the material are made to pass on several series of longitudinal turning cages, which keep them in continual contact with hot air sent upwards by means of a powerful ventilator.

The longitudinal series of turning cages are held in a light, solid, double iron framing, covered over with a brick wall or a wood-lined iron case of large size. The heating operations are performed with a large number of lower radiators, which receive steam at one end from a large copper tap, and are cleaned of all

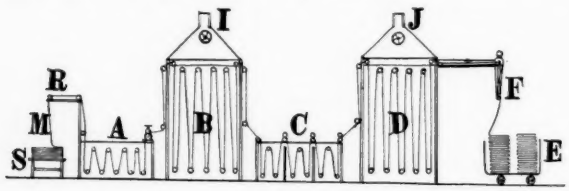

FIG. 4

condense water at one end by the assistance of a small steam trap. The cages are moved by a very large number of cast iron toothed wheels, all of which work in connection with an electric motor, gas engine, steam engine or fast and loose pulley, the last of which is driven from an upper or lower transmission.

A MACHINE FOR LARGE PRODUCTION

A plant which gives fair results for producing large batches of mordanted cotton cloth, which can be dyed in many shades, is constructed on the principle shown in Fig. 4..

This contains an impregnation vat A for the acetate of alumina bath, an upright drying oven B, the multiple impregnation vat C for the treatment with Turkey Red oil solution, and the second oven D for drying again the mordanted cloth. Vat A has thick walls and a high bottom, and is of concrete. It is sunk slightly in the floor of the dyehouse, so that it is at a comfortable height for the operatives. Its interior is lined with a suitable composition, to facilitate cleaning.

At the beginning of vat A is an entrance arrangement R, on which the three pieces of cotton cloth M are entered side by side from the low wooden table of stool S, all plaits and folds being eliminated by suitably placed copper-plates with lines in two directions. At the end of vat A is a pair of squeeze rollers, kept under elastic pressure by an arrangement of springs and upper screw wheels.

Oven B is rectangular shape and constructed of white bricks, mortared together solidly, except at the top where there is, on the left, a long narrow opening for the three wetted pieces and an opening on the right for the exit of the dried material, which descends after this into vat C. The top of oven B is furnished with hood I, joined to an upper chimney leading to the outside of the compartment, and just below this is placed a ventilator from which flows a stream of air passing upwards. On the front of oven B is a heavy, concrete door, which is opened when it is necessary to spread the fabric. This has also a rectangular glass window through which the interior of the oven, lighted by a conveniently placed electric bulb, can be closely observed from the outside.

Vat C is somewhat larger than vat A, and also made of concrete. It has two divisions which form three compartments of about the same size, and three pairs of squeeze rollers, running under light pressure, from springs and regulated by upper screw wheels. Oven D is of exactly the same construction as B, and has also hood J with ventilator. It is furnished, however, with two projecting arms for distributing the dry, fully mordanted cloth onto folder F, which forms two separate lots of pieces on three large iron trucks indicated by E. Both ovens B and D are heated by hot air prepared in a small apparatus at the back of the plant, and heated by steam, wool, coal or other means. The plant is driven from a single electric motor, a steam engine or a gas engine, as may be most convenient, and a regulator is applied through which the three lots of cloth being treated can be passed at any required speed, arranged in yards per minute.

OPERATION OF THE PLANT

Operation of the above plant would be more or less as follows: After entering three cotton tapes through the spreading arrangment R, on the upper and lower binding rollers in vat A, through the squeeze cylinders at its end, through the whole of oven B, through the three compartments of vat C and the respective squeeze rollers, through the whole of oven D, and so they hang loosely from the multiple plaiter F, three lots of the pieces to be mordanted are carried before the plant on separate trucks, and the ends of the first pieces are sewn to the tapes. The preparation of the hot air necessary for the heating of ovens B and D is then begun, and this is caused to circulate in the ovens; the ventilators working in hoods I and J and controlling the temperature in the interior of such ovens through special thermometers are turned on.

The bath of acetate of alumina is next introduced in vat A, and that of Turkey Red oil in vat C, the plants being started at the speed required for the class of goods being treated. The three lots of cotton fabrics are thus pulled forward on opening frame R, where the operatives rapidly spread them out before they have time to pass into vat A. Here they are impregnated repeatedly with the first bath of treat-

ment, while being conducted several times up and down; and by time they enter the nip of the squeeze rollers they have taken up the bath uniformly in every portion. These regulate the liquid to be left in the material, keeping it equal in all cases.

On leaving vat A the wet cotton material mounts into oven B, where it comes in contact with air heated between 65 and 70° C., and is slowly dried, leaving a content of about 8 to 10 per cent of moisture by the time it makes its exit at the opposite end. The water vapor and fumes of acetic acid developed in this case are sent upward and eliminated before they have the time to return in any portion on the cloth. On entering vat C the separate lots of material receive a repeated treatment in three separate baths of the Turkey Red oil, which may thus react thoroughly, transforming the aluminium salt into a soap, which is later dried in oven D, also leaving a contents of about 8 to 10% of moisture, and being delivered on truck E ready for transporting to the jig, or to a continuous dyeing machine, to be colored with the basic dyes.

Features of the Plant

The above plant possesses several marked advantages, of which the following offer the greatest interest to the manufacturer:

1. Three lots of cloth are treated during one run with the bath of acetate of alumina, dried, impregnated with the bath of sulphated oil, and again dried ready for the dyeing operations.

2. The production is very large, and the material prepared can be dyed outright.

3. When jigs are employed, the cloth can be dyed in many shades without any special inconvenience, if the mordanting operations have been conducted properly all through.

4. The speed of the different impregnations, and of the drying operations, can be regulated according to the nature of the material being treated, being conducted slower with the heavier and more rapidly with the lighter fabrics.

5. The length of time the material is in the ovens can be regulated at will by increasing or reducing the height and width of the latter.

6. The use of labor, steam, motive power and space is small in comparison with the production of mordanted cloth obtained.

7. The operatives have the fabric being treated continually under their eye, and can cut samples to determine if the mordanting is proceeding correctly.

8. Through the disposition adopted in ovens B and D no fumes and water vapor can make their way in the department of treatment.

(To be continued.)

The Dyer's School of Experience

[Editor's Note.—*The following narrative is one of a series being published under the general head of "The Dyer's School of Experience." Realizing that the genuine material for such a series is to be found largely among its own readers, The* Reporter *solicits contributions from that source and will pay for those accepted at regular space rates. Among the readers of this journal there should be many who have, in the course of their experience as dyers or chemists, encountered incidents which should prove most interesting and helpful to their fellows. Send all manuscripts to* American Dyestuff Reporter, 90 *William Street, New York City.*]

GETTING EXPERIENCE

By One Who Did

*Episode II**

WHILE in Reading, running the hosiery dyehouse, I kept a card system of formulas for all the current shades. A duplicate set of these was kept in the vault in the office. In the old days a dyer kept all his recipes in a book in his pocket, often in code, and the owner had to take a big chance if he let the dyer go. I heard of a case where the dyer left his coat on a hook while he went across the street for a drink. When he came back his book was gone and he had to throw up his job, for he was helpless without it. Then his second hand took another job and blossomed out as a first-class dyer on his own account. Those days are past; dyers to-day have to be able to work out their problems as they come along, and any man that puts dependence on a book of recipes cannot last very long. I brought my cards of formulas with me and soon afterward was engaged to start a hosiery dyeing department in connection with a silk skein dyehouse in Paterson.

This plant had two sources of water supply: the wells furnished a sparkling cold water of 20° hardness, and the raw water of the Passaic River was neither strained, filtered nor softened. It had a pale amber color and when acidulated and boiled would give a scum of brown slime. We had two 100-pound Monel-metal machines, one a rotary and one paddle. Later we put in three copper-jacket kettles and a 50-pound paddle machine. The water question was a source of constant worry. The best I could do was to use the river water in the paddle machine, add Glauber salt and ammonia, and boil it for ten minutes and skim off the slime that came to the surface, then add my dye and boil up again and skim. This was only a makeshift and was a constant source of worriment at

*Episode I was published in the issue of May 14.

every stage of the operation. The recipes I had used with success in Reading were worse than useless here, and every shade had to be rematched under the new working conditions.

On account of the water conditions it was never possible to do bleaching here, and another peculiarity developed which I have never seen elsewhere. We degummed in the rotary machine with oil and silicate. Soon the inside of the machine turned dark and resembled gunmetal. This rubbed off on the goods and caused stains on the finished goods. Investigation showed it to be sulphide of copper, caused by some sulphur compound acting on the copper in the alloy of Monel-metal. I found that hypochlorite of soda or peroxide would brighten the machine again, and after that we had to add a small dipper of peroxide to the boil-off and no further sulphur stains occurred. As no other dyer seems to have noted this state of affairs, I am inclined to believe that the river water contained some sulphides from dyehouse effluents, probably altered in some way, because we couldn't get a definite test for free sulphides in the raw water.

The hosiery department ran along for two years, until it was closed to make room for more profitable work, but there are no particular comments to make. Occasionally we received a compliment, and once in a while a complaint—what dyer doesn't?

While here I had many opportunities to study the dyeing of silk skeins, rayon and ribbon dyeing, skein weighting and black dyeing. What impressed me most was the complete disregard of weights and percentages and the element of guesswork that dominated all the matching of colors. All dyestuffs were dissolved outside the dyehouse and the dyers drew their dyes from barrels, stone crocks and pails. The dyer would take his helper over to the dye barrels and measure out by dippers, cups and spoons what he thought would make the shade. The helper would make up the dye bath and dip out a bowl of it and dabble a little slip of a skein in it for a while and look at it; then they would add a few more colors and try again. After several such try-outs the lot would be put into the liquor, given five turns, thrown up and a sample dried over a steam pipe. It is really remarkable how quickly one of these rule-of-thumb dyers can match his shades, but neither he nor anyone else could ever duplicate the combination the next time. It seems that a certain brown or tram was giving trouble, and a new dyer suggested a better way of doing it. They first dyed a medium deep green with Basic Green crystals, and then in a new bath dyed it with Acid Orange and a little Crocein Scarlet. I saw another dyer make his grays by dying first with Methyl Violet and later with Acid Orange and Yellow. In both cases the results were satisfactory, but the methods were a great contrast to those used by the wool and cotton dyers I have known or to the very exact methods I had to use in getting results with silk and cotton hosiery.

Skein silk is boiled off in pure green soap; sometimes brown oleine soap is substituted. They use about 35%, and a bath will serve for three lots, being replenished a little for each lot. No oils, silicate or alkalies are used, because the boil-off liquor is saved and stored in a tank for use in making up the dye baths. On a Monday in the summer or after a holiday it has an odor that is all its own, and reminds one of the Chinese origin of silk.

A skein silk dye bath consists of one-third or one-half boil-off liquor and the rest water. It is broken or acidulated with sulphuric acid or a mixture of sulphuric and formic acids. With basic dyes, which are still popular, there is a formation of colloidal oleates of the dyes, further influenced by the colloids from the silk gum. The result is that the dyes do not rush on the fiber, but dye slowly and evenly. With acid or direct dyes there is only the restrairing influence of the colloids. In both cases the silk absorbs large quantities of the free fat acids which assist in giving it the scroop. After dyeing, most lots are given a brightening bath or avivage as follows: The dyer puts a little olive oil in his copper bowl and pours over it a little concentrated sulphuric acid and shakes them together, then dilutes with water and pours the milky mixture of partly sulphonated, partly raw oil into the bath. You couldn't ever persuade a silk dyer to buy a definite sulphonated olive oil for this purpose—it is one of the traditions of the trade.

Weighting Skeins or Hose

Silk skein dyeing has seen its best days, but there is still some demand for it by the few Jacquard weavers, the ribbon manufacturers and ingrain hosiery knitters. In addition to the bright pure dye, some customers require weighting and some want souples. Souple is dull silk used for filling, the gum is only slightly removed by a treatment with tartaric acid, and the dyeing dare not be prolonged or some more of the gum will be detached and the silk will become more or less bright in spots.

The weighting of skeins follows the general procedure, which will be discussed in detail in a later article. I noted an incident which may be worth some further thought—silk skeins, six thread tram to be exact, was heavily weighted and dyed and knit into hosiery, which had all the elasticity and stretch one could wish for. Other silk hose were weighted after knitting, but were so rigid and unyielding they would not give a fraction of an inch and could not be put on although they felt perfectly soft and flexible and showed no evidence of the fibers being cemented together.

Black dyeing is another form of weighting, only iron and logwood are used instead of tin and phosphate. The boiled-off or souple silk is permitted to absorb as much as it will of red iron liquor, then hydro-extracted or whizzed. A wash with cold water precipitates a strongly basic iron sulphate in the fiber, and a hot soaping changes this completely to the hydrate. Then baths of logwood (containing more hematoxylin than hematine) and gambier extract

build up the dark-colored iron tannates which help both color and weight. Formerly prussiate of potash was used to add Prussian Blue to the mixture, but little of it is used at present. The whole operation is generally repeated, the logwood being used in a soap bath and, for a final touch, Hematine and black iron liquor are generally used. Sometimes a final topping with Methylene Blue is used. While the whole operation seems simple, it is really quite easy to make a mess of the whole thing, and a good black silk dyer is highly esteemed. There is a great deal of hand work involved, and the present high labor costs have taken all the profit out of this once popular line of work. So far no aniline, alizarine or vat dye has been able to equal the depth and beauty of the Logwood Black, and it is still in demand for satins and ribbons. Woven ribbons were dyed in skein form, providing they were not too wide, and then they had to be wound on a starwheel like delicate piece goods. To-day many ribbons have rayon warp and cotton filling. The whole trick consists in getting dyestuffs that will dye the two fibers evenly. If you haven't the right dyes no other remedies will give an even shade. Most rayon warp has been sized, and this must be removed before dyeing. Some sizings require a weak caustic soda boil to clean them entirely. In ribbon dyeing, as in many other lines, it is important to make a quick match, because too long working will ruin the goods. Silk and half-silk ribbons follow the same general rules as half-silk hosiery, and we have dyes that color either fiber without staining the other. There are no special difficulties, but there is plenty of trouble ahead for the rule-of-thumb dyer.

Rayon Winding—The Bugaboo

Rayon is really a whole story in itself, so I will just comment at this time on some of the outstanding features. The great bugaboo is winding—of course, everybody wants exact matches, but always perfect winding. There was a time when a skein of rayon fresh from the factory gave plenty of trouble to the winders, but now, with improved machinery, the new skeins are very good. No matter how perfect a skein, it only takes a little mechanical agitation in a hot bath to displace the threads a little, and when these are dried they dry as they were laid, bent or tangled and are inclined to stay that way. Every turn a dyer gives a skein lowers its winding qualities, so it is not hard to understand why developed or vat colors give so much trouble. If skeins are dressed up a bit and leashes and lace bands are straightened before drying, it will help a great deal. Cold drying is far better than hot drying, and a little mineral oil emulsion in the final wash will do wonders.

Vat dyes in particlar have a tendency to rush on so rapidly that the bath may be exhausted before the lot has had one turn. This is best corrected by dyeing cold with plenty of sulphonated oil and more caustic than the recipe calls for. Good work can be done on several types of machines, but there is still a need for a circulating type of machine where the threads cannot move at all.

We also found it a good plan to make a laboratory match of the shade wanted, using one vat dye if possible and never more than two, because when a lot is dyeing or thrown up every moment counts, and the time needed to reduce some more dye may be too valuable to waste. With rayons, more than any other fiber, a good dyer, capable of making rapid and exact matches, is the best investment.

Now, for the benefit of all dyers of rayon who have been abused and maligned time and time again, let me state that I have seen many tons of all grades and varieties of rayon, both domestic and foreign, dyed in case lots, under the most favorable conditions, and have never seen an instance where all the skeins were the same shade. With most lots three or four shades may be sorted out; all the skeins are evenly dyed, but if one searches carefully there is a chance you may find one skein that is half light and half dark with a tiny knot where the stock changes. We always kept these skeins separate to show to the customer when he started telling us what he thought of our work—but what's the use? The manufacturers don't seem ready to admit yet that it isn't the fault of the dyer.

There is another variety of weighted silk I neglected to mention—the so-called sumac dye. This is made so that when a burning test is applied there will be no ash to indicate weighting. Some dyers apply sumac extract with the acid dyes in the same bath, while others dye first and sumac afterward. Sumac weighting is never very heavy; they generally bring the silk back to par (16 ounces), or may go a few ounces over this. Sumac dyed silk is generally used to-day for lining satins.

Time went on and business conditions required the dropping of my department, so when I heard of what seemed to be a good opening I went into a new line—tin-weighted silk pieces, which I will discuss in the next article.

Oh, yes, the moral of this episode is: "Being a native-born American is a glorious thing—sometimes."

PHILIPPS BROS. NOW SONNEBORN AGENTS

The textile chemical products manufactured by L. Sonneborn Sons, Inc., are now being handled in the New England territory by Philipps Bros., of 170 Summer Street, Boston. Bernard Landers, in charge of the Boston office of Philipps Bros., is well known among New England mills, and in his connection as agent for the Sonneborn line of "Amilie" products, it is announced, he will receive problems relating to any textile chemical process and pass them along to the technical bureau of the firm.

AMERICAN ENGINEERING STANDARDS COMMITTEE CHANGES PROCEDURE TO SPEED NATIONAL STANDARDIZATION

Extensive revision of its rules of procedure to speed industrial standardization work on a national basis, is announced by the American Engineering Standards Committee. The chief object in broadening the procedure has been to make it so flexible that it may easily fit all of the varied conditions to be met in the wide range of industrial subjects covered by the committee's work. The revision is based upon the experience of the Standards Committee during its nine years of activity as a national standardizing body.

Three important changes are made in the procedure. Heretofore, each sectional committee—essentially a joint committee composed of representatives of the various groups interested in the particular work in hand—has acted under the administrative support and direction of one or more of the interested bodies, who are termed sponsors. A sectional committee may now operate autonomously, reporting directly to the A. E. S. C.; or it may act under sponsors as before. The second change recognizes "proprietary" standards and makes possible the revision of such standards within a single organization on condition that it be shown that a standard is acceptable to the groups concerned. This method is particularly applicable to highly specialized fields in which the standard of an organization has already achieved a position of recognized eminence. The third change provides for very simple cases. The approval of standards under such cases is based upon the action of a conference followed by written acceptances of the interested groups.

The revised procedure states that the different methods are founded on the principle that the basic test to be applied in all cases is the fact of the assent, affirmatively expressed, of the groups having substantial interest in the standard. Such groups have an inherent right to representation on the body dealing with the subject-matter of the standard, but it is not essential that this right be exercised.

Steps in Development of a Standard by a Sectional Committee:

The steps in the development on revision of a standard by a sectional committee are:

1. Standardization proposed by responsible body.
2. General conference called by A. E. S. C. to consider proposal and to decide whether the work shall be done; if so, whether the sectional committee shall operate under a sponsor or autonomously.
3. Recommendation of conference acted upon by A. E. S. C.
4. A sectional committee is organized.
5. The make-up and personnel of sectional committee approved by the the A. E. S. C.
6. Standard drafted by sectional committee.
7. The draft standard published or circulated for criticism.
8. Proposed standard approved by sectional committee by letter ballot.
9. Proposed standard approved by sponsor, if there be a sponsor, or formally indorsed by at least one co-operating body if the sectional committee is autonomous.
10. Standard approved by A. E. S. C.
11. Standard published by sponsor, or by the A. E. S. C. if sectional committee is autonomous.

Steps in Approval of Existing or Proprietary Standards:

1. An existing or a proprietary standard submitted to A. E. S. C. for approval by a responsible body.
2. Investigation of facts regarding consensus through A. E. S. C. agencies; or the development of the acceptability of the standard through a representational committee.
3. Standard approved by A. E. S. C.
4. Standard published.

Steps in the Development of a Standard by General Acceptance:

1. Standardization proposed by a responsible body.
2. Survey of field made, and draft standard produced by working committee.
3. Draft standard considered by general conference.
4. Proposed standard formally accepted by groups concerned.
5. Standards approved by A. E. S. C.
6. Standard published.

The governing authority of the American Engineering Standards Committee is at present vested in sixty-three men representing thirty-six national organizations, industrial, technical and governmental. About 350 national organizations are officially co-operating in the work, with 2,100 individuals engaged on various committees. Up to the present time, 111 national standards have been approved, and 164 additional projects representing almost all branches of industry are under way.

NEW NOVA SCOTIA PLANT TO PRODUCE CHEMICALS

The Sodalumina Chemical Corporation of Canada (Ltd.) has formed the Pictou Chemical Company (Ltd.), and will erect a plant near New Glasgow, Nova Scotia, in the near future. According to report from Trade Commissioner Walter J. Donnelly, Montreal, it will be the first ten units to be established by local capitalists. It is stated that about 50 units will be installed in two years. The new plant will have a capacity of 500 tons of clay and for each ton of clay treated, one-half ton of coal and salt will be required. The principal products will be hydrochloric acid, soda ash and aluminum oxide.

Halbert Webb, who has had charge of the dyeing department of the Hartsell Mills Company, Concord, N. C., has accepted a position with the Roanoke Mills Company, Roanoke Rapids, N. C.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
90 William Street, New York City

A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XVII May 28, 1928 No. 9

A REMEDY FOR RAYON DYEING TROUBLES

IN many of the larger mills where testing of supplies and materials is a part of the chemist's routine the dyers need to know little chemistry beyond that required for carrying out their processing. Actually, of course, the high-grade dyer will have at his finger tips almost as much theoretical chemical knowledge as the "chief"; in fact, it is not unusual for the head dyer to step eventually into the chemist's shoes. But in ordinary practice, in mills housing a laboratory, many dyers depend entirely on the chemist for assurance that their colors and drugs are up to standard. They depend on the laboratory for assurance also that their goods have been properly prepared for dyeing. In treating fabrics containing rayon, therefore, the dyer working under this checking system does not trouble himself about testing the rayon to determine its exact dyeing properties. If his mill is run efficiently, that testing is done for him by the laboratory and he simply follows specifications.

Where no chemist presides over the bottles and scales in the drug room, however, as in most mills of moderate size, the head dyer may follow one of several procedures. He may be sufficiently educated in textile chemistry to handle some testing apparatus and check up regularly on his dyes and other supplies. Or, lacking the technical knowledge, he may call for assistance in many matters upon the firms that supply his colors and drugs. In taking the latter course he cannot, unfortunately, always be certain that his supplies are up to standard, but a few trials in the dyehouse will quickly show up inferior products.

But how may such a dyer, not technically trained nor equipped to carry out complicated laboratory tests on the materials sent to him for processing, learn to know what type of rayon has been used in his goods? This information may, of course, come to him from the mill with each batch of material. Experience has shown, however, that the mill office is not the most reliable authority in the world on the subject of rayon; for it is common knowledge that rayon is being purchased by too many mills on the basis of price and appearance, and that in general no accurate tests are made to determine the *dyeing properties* of each sample submitted to the purchasing man.

It follows, therefore, that if our practical dyer pins his faith solely to the data on the ticket on each batch of goods so far as the kind of rayon is concerned, he is really "going it blind." He is dyeing a chemical fiber, mixed, most likely, with natural fibers, in a chemical solution of dyes and drugs with no assurance that he will produce the right chemical reaction; no assurance because he lacks reliable information on the type of rayon in his goods. Furthermore, he carries out this hit-or-miss operation even though he knows that each type of rayon has its own peculiar chemical properties and consequently its own special affinity for dyestuffs. He is, in short, *experimenting* every time he dyes up a batch of goods containing a new, unidentified lot of rayon—experimenting in the dark. The fact that his mill has told him what kind of rayon they purchased means nothing. Mixed lots of yarn are certainly not uncommon and the rayon has not been tested for such differences by the mill. But they do not remain unknown for long after they enter the dyehouse; all differences in dyeing properties are soon revealed—in the dye bath.

Is this not a costly system, if it may be called a system, of testing rayon—depending on the dyer to hit the right formula before he has spoiled part of the batch? Would it not be much safer, more efficient, to make a few simple tests in the dyehouse to identify the rayon before it is ordered and again before it is dyed?

It is strange that although all well-informed dyers know how to dye the various kinds of rayon, few seem to know the tests for identifying them. How can their knowledge of dyeing methods be put to use if they cannot determine the exact nature of the rayon in their goods?

The REPORTER has ventured in the past to declare that many of the most common troubles met with in dyeing rayon may be traced back to careless purchasing of the yarn, and it has tried to stress the importance of testing all rayon for dyeing properties before any orders are placed. This preliminary testing would logically fall to the mill chemist or, lacking a chemist, to the head dyer. We have even ventured to argue that every dyer may rightfully demand, for his own protection as well as for that of his mill, the privilege of testing rayon before it is bought. But this argument is quite obviously pointless if the dyers are unable to identify the rayons by simple chemical tests.

The whole problem, therefore, of finding a remedy

for most of the difficulties that make life miserable for rayon dyers reduces itself to the comparatively simple matter of teaching dyers the identification tests. When that much has been accomplished, rayon will become far more popular in the dyehouse than it now is.

ADMINISTRATION OF THE I. G. FARBENINDUSTRIE

Recent statements of Dr. Bosch of the I. G. Farbenindustrie in regard to the reorganization of the company give an idea of certain details of management which have had little publicity hitherto, according to Consul Clarborne, Frankfort-on-Main.

After the big fusion, it was found to be easier to reorganize plant output—by allocating production to one or two plants—than to reorganize sales and management. Some time elapsed before it was generally recognized that drastic action in the latter regard was necessary. Dyestuffs sales were concentrated in four offices with territories divided according to State boundaries. This, it appears, proved a serious mistake, and soon it became apparent that the amalgamation of these offices in Frankfort would be desirable. The same experience was evident in the case of pharmaceuticals which at first were located in Leverkusen and Hochst. It is now planned to centralize the sales of pharmaceuticals in one office.

The history of the I. G. Farbenindustrie, according to Dr. Bosch, shows a development from a form of absolutism to a council system; from a general director for the former single companies to a council of two, and from this council to a larger board with a chairman. On this principle the management of the I. G. Farbenindustrie was formed, and, although it was recognized that a smaller board would be advisable, it was found necessary for personal reasons to include all the members of former boards in the new I. G. board of management. From this, however, a smaller working committee of twenty-six was chosen. This committee now meets in Frankfort every three or four weeks, when matters which had already been discussed by expert committees and prepared for decision are considered. Moreover, at such meetings the general outlines of the company's policy are drawn up. In the expert committees, to which the directors of all the single departments belong, the real work of the concern is accomplished, complemented by the co-operation of numerous technical and subcommittees. The board members who do not belong to the working committee of twenty-six act as heads of departments. In view of the responsibility borne by them, they are entitled to full knowledge of the decisions of the working committee of twenty-six and to demand a fresh consultation on any subject either in their own presence or in the presence of other authorities.

Concerning the board of directors (Aufsichtsrat) it is stated that its influence in the single companies of the past gradually diminished as the founders retired. The former directors' boards are now represented in the I. G. by the "management council" (Verwaltungsrat), which has a number of important prerogatives such as the surveyance of the company's business, supervision of the managing board and the choice of directors, and the authorization of agreements with other countries. Its members also have the right to attend the regular meetings of the managing board, but have merely advisory powers.

EXTRACTORIALS

The house builded upon a foundation of solid rock for only half of its structure and upon the sand of public ignorance or indifference for the other half is not, after all, a sound house for its tenants when the rains fall and the floods of economic depression lash its trade walls. Industry must build solidly in all of its departments if the structure is to stand.—*W. G. Conover, president of the Laundry Owners National Association, before the National Association of Dyers and Cleaners.*

In the field of scientific and economic research, in statistics, in simplification and standardization of commodities, in the promotion of arbitration, in developments of foreign trade and in scores of other directions, trade associations have made a most valued contribution to our economic progress. While our industry and commerce must be based upon the incentive of the individual, yet the national interest requires a certain degree of cooperation between individuals in order that we may reduce and eliminate industrial waste, lay the foundation for constant decrease in production and distribution costs, and thereby obtain fundamental increase in wages and standards of living.—*Herbert Hoover.*

Research in all branches of industry has been greatly stimulated since the World War. The interruption to communication during the war taught the necessity of developing national resources to meet, so far as possible, all the needs of a country, and it has come to be realized that only scientific investigation will give the exact knowledge required for the development of these resources. The consequences of this realization are far-reaching, for the law of self-preservation applies not only to nations but to industries, to corporations and to individuals, in time of peace as well as of war. Europe can only look with admiration at America's astounding progress since the war.

A company which has once established a research organization never regrets it. And when one company has started research in a particular line, other companies must do likewise or be forced out of business, since there are few industries where competition is not very keen.—*C. Flury, in Industrial and Engineering Chemistry.*

At the very root of our difficulties lies the craze for volume. We'd sooner have volume than profits. A full factory and red ink seems as popular as 60 per cent operation and plenty of black. Crazy for volume. Swollen sales expense to get the last 20 per cent of business. The goal is volume, not profits.—*E. J. Mehren, Vice-President of the McGraw-Hill Publishing Company.*

Often energy and brains are directed into sales channels that could be used more effectively in the production department. Sales come naturally when the product is right in price, in quality and in design.

Sales ability does not explain the amazing success in crowded markets of a new ginger ale, a new cotton fabric, a new automobile, a new magazine. Talk does not wedge these products into popularity. The appeal is in the goods themselves.

Statements that our production problems in this country are solved, and that we must now give our attention to questions of distribution, are not half true. In the fields of design and style we have so far to go that every manufacturer has a lifetime of worry ahead of him.—*William Feather.*

It is a known fact that most of the successful new processes of to-day, not only in the textile but in all other industries, are the result of successful teamwork in the plant between the technical and the practical men. You might think that the technical men represent theory and the practical men practice, but such is certainly not always the case. Often the theory of the practical man who has had years of contact with this or similar processes may be more nearly correct than that of the technical man.—*Prof. Chas. E. Mullin.*

For the successful operation of large plants it is absolutely necessary for men to learn how to get along with other men. The failure of many is caused by their inability to get along amicably with others. The most successfully managed plants are those wherein dwells a great co-operative effort, all the forces pulling and pushing together, every man working as though the success of the whole establishment depended upon him.—*Canadian Textile Journal.*

What is a variable? A variable is any condition or factor in any process which, if varied, may change the results obtained from the process. The recognition and control of variables may mean the difference between a good and a bad washing process. Many a chemist has failed to duplicate a chemical process which he has worked out because he failed to recognize some obscure and seemingly unimportant variable.—*Dr. Charles Fehr in Starchroom Laundry Journal.*

RECENT LITERATURE

MELLON EDUCATES PUBLIC ON WEARING APPAREL

A series of seven radio talks on "Wearing Apparel, Its Manufacture, Utility, Selection and Care," broadcast from the University of Pittsburgh studio of KDKA has just been issued in booklet form by the Mellon Institute of Industrial Research.

These educational talks comprise the following titles: "Cotton Fabrics," by Charles F. Goldthwait; "Undergarments," by Edgar R. Clark; "Wool Clothing," by Lloyd E. Jackson; "Silk Garments," by Helen E. Wassell; "Rayon Goods," by George H. Johnson; "Furs," by Lloyd E. Jackson, and "Hats," by Rob Roy McGregor. The talks are popular treatments of each subject, rather than technical discussions, owing to the nature of the audience to which they appealed, but several of them contain information of interest and value to anyone handling textiles in the process of manufacturing or teaching home economics and textile chemistry. The booklet may be obtained from Mellon Institute for fifty cents.

Philadelphia's Textile School

The Pennsylvania Museum and School of Industrial Art —Circular of the Textile Department (Philadelphia Textile School), 1928-1929.

The latest number of the annual bulletin issued by the Philadelphia Textile School is in every respect as interesting, if not more so, than previous numbers. It contains, in general, complete information on the courses of instruction in textile manufacturing and design offered by the school, with excellent descriptions of each course and of the equipment employed, with lists of school officers, faculty, graduates and school calender.

The bulletin is well printed and illustrated with a number of attractive photographs of the various classrooms, laboratories and departments of the Philadelphia Textile School.

What the Silk Industry Did Last Year

Fifty-sixth Annual Report of the Silk Association of America.

An authorized laboratory test for establishing the wash fastness of dyed silk fabrics was adopted by the board of managers of the Silk Association last year, according to the report of the secretary, which forms an important part of the association's annual report. Consultation was held with various silk manufacturers and laboratory ex-

periments were conducted previous to its adoption. In this action we have additional evidence of the growing interest of the entire textile industry in the standardization of fabric fastness. In connection with this test a general washing practice for use by the consuming public was approved and recommended for distribution by the Silk Association. We may interpret this step as an effort on the part of the silk manufacturers to establish a closer contact with the actual consumer of their products.

Innumerable other items of equal interest make this year's report of the Silk Association a significant contribution to current surveys of conditions in the American textile industry.

A series of meetings were held recently at the headquarters of the Silk Association by dyers, in an attempt to come to some conclusion on the subject of weighting. As a result a resolution was passed recommending that as the most satisfactory results are secured on flat crepe, crepe de Chine and georgette at a weighting of 30 or 40 per cent, in the process of tin-weighting piece-dyed merchandise, no goods other than raw chiffon be given more than three passes of tin or 30 to 40 per cent weighting.

The report also includes a number of interesting trade reports presented by well-informed representatives of the silk industry. A survey of progress in skein silk dyeing is contributed by Jacob Knup, Sr., of the Hellwig Silk Dyeing Company. The report on Dyestuffs is presented by H. F. Atherton, secretary of the National Aniline & Chemical Company. The silk printing trade is reviewed by Frederick H. Knight, treasurer of the Sunbury Converting Works. The report on Piece Dyeing and Finishing comes from C. L. Auger, of the National Silk Dyeing Company. Other trade reports in this section of the book cover rayon, commission throwing, conditioning and testing, tie silks, etc.

APRIL IMPORTS OF DYES SHARPLY INCREASE

THE quantity of synthetic dyes imported through New York and other ports during the month of April was considerably larger than that of any preceding month of this year. The imports by ports were as follows: New York, 621,882 pounds, with an invoice value of $493,251; Boston, 11,933 pounds, with an invoice value of $11,901. The following figures have been released by the Department of Commerce, Bureau of Foreign and Domestic Commerce, and the United States Tariff Commission:

1928—	Pounds	Invoice Value
January	415,156	$327,148
February	478,407	391,351
March	378,191	316,183
April	633,815	505,152
Total, four months	1,905,569	$1,539,834

1927—		
January	196,620	$186,387
February	312,277	262,364
March	404,714	352,414
April	402,783	323,732
Total, four months	1,316,394	$1,124,897

Per Cent of Dyes by Country of Shipment

	April, 1928	April, 1927	Jan.-April, 1928	Jan.-April, 1927
Germany	75.00	64.00	62.56	47.62
Switzerland	15.00	18.00	25.76	31.98
France	2.00	3.00	1.79	3.58
England	2.00	4.00	2.27	5.65
Belgium	2.50	7.00	2.90	6.72
Canada	1.00	3.00	2.40	2.82
Italy	2.00	1.00	1.95	1.58
Netherlands	0.50	....	0.37	0.05

Leading Dyes, by Quantity, Imported During April

	Pounds
Vat Golden Yellow GK Double Paste (single strength)	38,306
Vat Blue GCD (single strength)	21,622
Vat Brown G (single strength)	18,518
Brilliant Indigo 4B (single strength)	14,737
Rapid Fast Red GL Paste	14,500

Applicants for Membership

American Association of Textile Chemists and Colorists

Active Membership

Barker, Wyss L., demonstrator, National Aniline & Chemical Company, Charlotte, N. C. Sponsors: C. H. Willard and K. Mackenzie.

Bick, Carl E., superintendent of dyeing, Real Silk Hosiery Mills, Indianapolis, Ind. Sponsors: A. J. Mease and A. T. Brainerd.

Feit, Al J., salesman and demonstrator, Newport Chemical Works, Inc., Chicago, Ill. Sponsors: A. J. Mease and R. P. Cole.

Skinkle, John H., instructor, Lowell Textile Institute, Lowell, Mass. Sponsors: L. A. Olney and A. K. Johnson.

Stevens, Raymond R., dyer, Felters Company, Inc., Millbury, Mass. Sponsors: J. B. Manning and F. L. McCool.

Junior Membership

Scheuer, Edwin B., chemist, Geigy Company, New York City. Sponsors: D. P. Knowland and A. F. Wiehl.

Technical Notes from Foreign Sources

Dyeing of Cellulose Esters

W. H. Dawson, C. W. Soutar and R. J. Wood (British Alizarine Company, Ltd.); English Patent No. 275,752.—Esters of cellulose may be dyed in yellow to orange shades from a bath containing nitro-acridine or poly-nitro-acridine compounds, with or without the addition of an acid or salt. The dyes may be obtained by nitration of acridine or its substitution products.

Bronzing of Sulphur Blacks

Deutsche Faerberzeitung 63, 1209 (1927).—It is pointed out that the requisite amount of sodium sulphide in the bath depends first of all upon the particular dyestuff being used, each dyestuff working best with a definite amount of sulphide. Too little sulphide means the presence of undissolved dyestuff in the bath; too much hinders the bath from exhausting well and so produces weak dyeings. The first rinse should contain 2% of sodium sulphide. Trouble is especially met with in dyeing where the goods are more or less exposed to the air during the dyeing, in which case bronzing is to be ascribed to oxidation of some of the sodium sulphide and consequent precipitation of some of the dye as deposited solid upon the surface of the fiber. In this case about ¼ more sodium sulphide must be used to allow for oxidation. Squeezing before and during rinsing must be thorough. It is also recommended to aid to the last rinse, beside starch, a mixture of soap and oil; e. g., a boiled-up mixture of 1% lard and 1% starch, or 1% lard and 1% soap soap. Goods which have bronzed can be improved by passing through a boiling bath of weak sodium sulphide, by which the dyeing is reduced in strength, but leveled, so that a subsequent dyeing will bring up to the desired standard.

Dyeing of Pelts in Benzine Bath

Deutsche Faerberzeitung 63, 1211 (1927).—Almost all basic dyes may be used for dyeing pelts in a benzine bath. Enameled vessels should be used, and the pelts must be thoroughly clean. Alcohol, benzine-soap and volatile (organic) acids favor exhaustion of the bath. For example, a suitable quantity of strong benzine-soap solution is prepared, also a bath of 10 liters benzine, 1 liter alcohol, and 1/20 liter glacial acetic acid. The two are mixed and allowed to stand for about one hour, when the lower aqueous layer, which will have settled out, is run off. To the benzine-alcohol-acid layer is now added the previously-prepared solution of the dye in alcohol (should be fairly strong). The whole is now heated in a water bath for complete solution of the dye. Dyeing is carried out warm (water bath). This method gives deep dyeing; weaker ones require a correspondingly weaker bath. The stronger the dyeing desired, the more soap, alcohol and acid must be used. Goods dyed delicate shades are simply centrifuged; deeper dyeings are rinsed once, rapidly, in benzine.

Delustering and Dyeing of Union Goods Containing Acetate Silk

Deutscher Faerberzeitung 63, 1226 (1927).—The fact that acetate silk loses its luster when treated with water or soap solutions at about 70° or over, while formerly a disadvantage, has been utilized for production of goods which purposely show no luster, but still retain the "feel" characteristic of silk; what was formerly a disadvantage making possible a new type of fabric. This delustering can, of course, be carried out in mixed cotton-acetate or wool-acetate mixtures; and as the different behavior of acetate silk and cotton, for example, toward dyes is well known, it is possible to produce two-color effects which, through previous delustering of the acetate silk component of the weave, appear of uniform luster.

Various methods of dyeing are possible. While the direct cotton dyes usually leave the acetate silk pure white, some dyes which take well on the acetate silk also dye the cotton. In such cases the cotton dyeing may be stripped with a cold to lukewarm hydrosulphite bath, without the dyeing on the acetate silk being affected. The cotton can then be dyed with a direct cotton color. In some cases, with suitable dyes, both elements of the goods may be dyed at the same time with their appropriate dyes in one bath; the temperature being raised from 30° at the beginning to 80°, and only at the end about 10 to 25% Glauber salt being added, to aid exhaustion of the bath (for the cotton). In the two-bath process it is recommended to dye the acetate silk first with its proper dye, then to dye the cotton with a direct cotton dye which does not touch the acetate silk. If basic dyes are to be used for deep dyeings of the cotton element, the acetate silk is first dyed, the goods then tannin-mordanted, and the cotton dyed cold with the basic dye in the presence of considerable acetic acid. If the goods must be dyed specially fast, sulphur dyes may be used for the cotton. In this case, to protect the acetate silk from de-acetylization through the alkaline sulphide of the sulphur dye bath, a protective colloid, such as glue, gelatine, Protectol, etc., should be added to the bath. For one part sulphur dye, two-third parts sodium sulphide or two parts Glauber salt, as well as two parts hydrosulphite should be used. In employing vat dyes the difficulty of de-acetylization of the acetate silk disappears if one uses sodium phenolate instead of caustic soda.

It has been found that certain inorganic salts, such as magnesium sulphate, ammonium sulphate, or common salt, added to the bath, increase the resistance of the

acetate silk to delustering by the hot bath, if the retention of the luster is desired.

In dyeing union goods of acetate silk and wool, since most acid dyes do not color acetate silk, the same general two-bath treatment may be employed, the acetate silk being first dyed with its own proper dye, and then the wool with the acid dye. In unions of acetate silk and raw silk the latter must first be freed from bast. The bath for this purpose of 10% Marseilles soap per liter should also contain 3% of sodium phenolate, and should be used at a temperature not exceeding 75° to 80°. The second bath of 5 g. of soap per liter, should be used at the same temperature. The dyeing is carried out as in the case of acetate silk-wool goods, but the silk is first dyed with a substantive dye and the acetate silk dyeing subsequently.

Notes on the Dyeing of Viscose Silk

Deutsche Faerberzeitung (*Textilchemiker u. Colorist* 178) 63, 1927.—The statement is frequently made that viscose can be dyed like cotton, but the influence of the choice of the correct dye upon the uniformity of results has not been sufficiently considered. It is known that a dye which takes on cotton most slowly gives the most level dyeings, but for viscose the direct contrary is true. There are four points to be considered in choosing a suitable dye for viscose; first, those dyes which give a high number in a capillary test give the best results; second. well-leveling dyes exhaust rapidly; third, viscose which has been dyed with a well-leveling dye loses, in a boiling soap bath containing undyed viscose, some of its dye, is taken up by the undyed material; while viscose dyed with a poorly leveling dye gives up little of its dye under this test, and the undyed viscose is hardly colored; fourth, level dyeing colors require the least Glauber salt in the bath; experience has shown that the less Glauber salt is used the more level the dyeings.

Mixed dyeings should be carried out with dyes which possess capillary numbers as nearly the same as possible (and as high as possible), otherwise poor results will be obtained.

Products of Fast Printing

D. R. P. No. 433,276, *Zusatz.*—Cotton is printed with a paste which contains the alkali salts of azo dye components which are suited for the production of azo dyes upon the fiber, plus the sulphinitrosominic acids of amino azo dyes, together with the usual thickeners, then steamed and developed by acids or solutions of acid salts, and subsequently by solutions of the salts of organic acids. Development can also be brought about by treatment with acid vapors.

Printing with Vat Dyes

D. R. P. No. 444,962.—The vat dyes are printed with alkalies or alkaline substances, and zinc dust or other metals which evolve hydrogen with alkalies, the metals being in excess over the alkalies, and the goods then steamed. In order to avoid the destructive effect of the caustic alkali, a mixture of alkali bicarbonate and alkaline earth hydroxides is preferably used, the alkali needed for reaction with the metal for production of nascent hydrogen then forming chiefly only on steaming. The printings can be kept for a reasonable time before steaming, so that the process is suited for hand printing. The shades are fuller in most cases than those obtained by other methods.

Dyeing of Acetate Silk

D. R. P. No. 444,961.—Acetate silk is dyed with basic dyes with addition of not more than 5 g. of a sulphocyanide per liter of bath; if necessary, water soluble colloids are added also. Dyeings obtained are fast to rubbing.

Resists on Silk

D. R. P. 448,847.—Silk is treated before dyeing with sulphonation products of phenol, with or without addition of salts of tin; or these are added to the bath. The silk remains pure white. The silk, undyed or previously dyed with acid dyes, can be mordanted with sulphonation products of phenol, and then a component of artificial silk or cotton (in union goods) dyed with direct cotton or basic dyes; or the sulphonation products mentioned may be added directly to the bath containing the direct cotton dyes.

Indanthrene Dyes on Weighted Silk

Deutsche Faerberzeitung 63, 1234 (1927).—Indanthrene dyes cannot be dyed on weighted silk, as the weighting suffers. If used, they must be applied to unweighted silk, and this then weighted, but the shade becomes lighter in the process. It is suggested that for such a purpose the acid alizarine dyes which give a fastness approaching that of the Indanthrenes be used.

(In another reference, Deutsche Faerberzeitung 63, 1256 [1927], it is suggested that it is irrational to employ comparatively expensive highly fast dyes such as the Indanthrenes upon material so short-lived as weighted silk. If they are used upon unweighted silk, a protective colloid, such as glue or Protectol, must be added to the bath to avoid damage of the silk by the alkali of the vat.)

Affinity of Soluble Vat Dyes for Cotton

J. E. G. Harris, J. Soc. Dyers and Colourists 43, 362 (1927).—Quoting a statement by Peterhauser in a recent lecture to the effect that certain Indigosols not yet on the market possess a marked affinity for cotton, H. points out that the Soledon series of dyestuffs on the market for the last few years have such excellent affinity for both animal and vegetable fibers that they can be applied by the ordinary methods of dyeing. These Soledon dyestuffs are mostly sulphuric acid esters of the enolic form of vat dyes and are of anthraquinonoid nature. The Indigosols mentioned by P. as having no affin-

ity for vegetable fibers are of indigoid or thio-indigoid nature. P.'s notice of the existence of Indigosols possessing this desired affinity for cotton is therefore of high interest.

Identification of Dyestuffs on Cellulose Acetate

C. M. Keyworth, J. Soc. Dyers and Colourists 43, 343 (1927).—An important article dealing with the identification on acetate silk of a considerable number of new dyes specially recommended for use upon that material. The method used is in general the one familiar through Green's tables. Reagents used are carefully described and the results (color changes, stripping, etc.) tabulated in sixteen full-page, fine-print tables, representing an enormous amount of labor. An abstract cannot be given; those interested should consult the original article.

Printing with Basic Dyes

D. R. P., No. 446,485.—The free dye bases or their leuco compounds are prepared from the dyes (salts) and treated with alkaline mordants; as such the reaction products of phenols or aromatic amines, or their derivatives, in the alkaline sulphur melt, as for example, the commercial products Katanol or Phenoresin may be used; diamine dyestuffs or sulphur dyestuffs may also be used for the latter purpose. By using the free color base no previous lake formation takes place in the printing paste. The procedure can also be employed for the printing of white goods, and as resists under Aniline Black and other oxidation dyes, or as hydrosulphite discharges.

Stable Developing Salt for Dyeing

Swiss Patent No. 118,686.—A dry, neutral or acid salt of a diazotizable aromatic amine is mixed with a dry nitrite; instead of the salts of the amines with mineral or other acids may be used other diazotizable acid derivatives of aromatic amines; for example, N-sulphonic derivatives of an amine (sulphaminic acid derivatives) or their salts. To these mixtures may be further added acid substances such as bisulphates, naphthalene-trisulphonic acid, sulphuric acid, phosphoric acid, and indifferent dilutive agents, such as Glauber salt, common salt, more or less dehydrated aluminium sulphate or alum, or magnesium chloride, aryl-sulphonates, etc. The mixtures thus prepared give at once, on solution in water, diazo solutions capable of coupling. Turkey Red oil, formaldehyde-phenol condensation products, etc., may be added to increase the ease of penetration.

Dyeing with Vat and Azo Dyes

Austrian Patent No. 106,706.—Cotton, artificial silk or silk is padded with an azo dye component and at the same time with a vat dye brought into solution (vatted) by any of the customary methods. The oxidation of the vat dye to its insoluble form is accomplished simultaneously with the development of the ice color through the diazo solution used for the development. As such azo components are mentioned, the naphthols, benzoyl-amine naphthols, ureas of aminonaphthol-sulphonic acids, arylides of 2-hydroxy-3-naphthoic acid, pyrazolones, acetic acid arylides, etc.

Light Sources for Testing the Fastness of Dyes

J. H. Hadfield, J. Text. Inst. 18, 152T (1927).—A thorough examination of the subject. After a discussion of the varying values of sun and sky light a table is given of the various light sources "well worth considering for a dye testing lamp from the point of view of intensity and energy distribution." The list of sources is worth quoting: Moore color-matching lamp (filament lamp in atmosphere of carbon dioxide), acetylene flame, Nernst lamp, carbon filament lamp, tungsten filament lamps (vacuum, gas-filled, stereopticon, movie, photographic, and special types of wattage from 40 to 10,000), tungsten arc, carbon arc crater, high intensity arc. (The table also includes sun and sky for sake of completeness. For each source is given the true temperature of working, the "color temperature," each in absolute degrees, and the intrinsic brightness. These various types are fully discussed, with particular reference to the spectral values. Ten graphs are given for energy distribution of the various types, beside a few graphs and tables for other evaluations. A list of sixty-three references to other works cited is appended. Altogether a valuable paper.

Application of Vat Dyes

Eng. Pat. No. 272,941.—Vat dyes are vatted with hydrosulphite and caustic soda and an aldehyde or ketone, as formaldehyde or acetone, added to the bath before dyeing, which is carried out at or near the boiling point.

Loading and Dyeing of Cellulose Esters and Ethers

Eng. Pat. No. 272,982.—Goods made of or containing carboxylic esters of cellulose, or cellulose ethers, are dyed or printed after loading with insoluble metallic salts, which increase the affinity of the fiber for dyes, or create that affinity where it did not exist, so that the goods may be dyed with direct, acid, basic, or other dyes. The loading agents are formed in the goods by impregnating these with a salt or salts of tin, zinc, tungsten, or aluminium, and subsequently passing them through a bath containing a phosphate or silicate or tannin, the metallic constituent being thus precipitated in the fiber by reaction with the second bath component. The first bath is best used not below 50° C. The loading may be repeated.

Locally Saponified Delustered Acetate Silk

Eng. Pat. No. 273,001.—Acetyl silk may be locally saponified by printing with caustic alkali, washed, and then as a whole delustered without altering the luster of the saponified portions. By subsequent treatment with a substantive dyestuff having no affinity for cellulose acetate (e. g., chrysophenine), the saponified part alone is dyed. Or, the unsaponified portions only may be dyed

with a suitable dye, or the whole may be dyed consecutively or simultaneously with dyestuffs appropriate for the cellulose and cellulose acetate. Delustering agents mentioned are boiling water, organic acids such as formic, acetic, or lactic acids, ketones, aldehydes, phenols, and aromatic bases, such as pyridine or aniline.

CAROLINA STATE COLLEGE TEXTILE SCHOOL COMMENCEMENT

This week another group of trained young textile manufacturing men will enter the Southern branch of the industry following the annual commencement exercises of the Textile School of North Carolina State College, which will be held June 3, 4 and 5. The graduating class of 1928 consists of seventeen young men who have completed all required work in the textile courses of the school.

During the exercises the student's medal awarded annually by the National Association of Cotton Manufacturers to the student making the best record in the four-year textile manufacturing course will be presented to Zebulon Boyce Mangum, of Birmingham, Ala. Frederick M. Snyder, secretary of the Press Congress of the World, will deliver the commencement address on the morning of June 5, after which diplomas will be presented to the graduating class.

These exercises will close one of the most successful years in the history of the Textile School of North Carolina State College. It has been marked by increased enrollment and the establishment of an additional research laboratory, completely equipped for research work on starches and other materials used in the dyeing and finishing of textiles. The Textile School also conducted a successful textile institute which was attended by mill men from several States, and a Style Show in which young ladies in the home economics department of Meredith College wore dresses made by them from fabrics designed and woven by students in the Textile School, to demonstrate the beauty and utility of cotton fabrics.

When the additional research laboratory was completed, every cotton mill in North Carolina was asked to send a sample of its starch to the school for a series of exhaustive tests which are now being conducted by the staff of the dyeing department, under the direction of Prof. A. H. Grimshaw.

During the year many tests were made by the staff of the Textile School for the mills of the State, and several representatives of textile firms conducted experiments in the experimental room at the school, which has been especially established for and placed at the disposal of Southern textile mills.

Every member of the graduating class has been placed in a textile position, and Dean Thomas Nelson states that many more could have been placed, as the requests for men exceeded the number of textile graduates.

AN ACTIVE DAY'S OUTING PLANNED FOR PHILADELPHIA TEXTILE SCHOOL ALUMNI

Members of the Alumni Association of the Philadelphia Textile School will line up in their respective automobiles at the City Hall of Philadelphia on June 8 for the Annual Cruise (rain or shine) to the Manufacturers' Country Club. The winner will be awarded a lucky pennant, which entitles holder to a new tire.

The occasion for this notable event will be the annual meeting of the Alumni Association. A business meeting will be held at the school on June 7, during which officers and committees will report and a number of technical papers will be presented by members. New officers and directors of the association will be elected.

The Annual Cruise will open the following day's events. Features of the day's program, as of yore, will include the Annual Association Handicap Golf Championship, the Baseball Championship and other field events. In the evening all participants will return to Philadelphia to attend the Annual Banquet, to be held at the Manufacturers' Club. Speakers for the evening will include Eli Kirk Price, president of the Pennsylvania Museum and School of Industrial Art; John E. Edgerton, president of the National Association of Manufacturers, and "Senator" Edward Ford, of New York.

NEW BORDEAUX ON NATIONAL LIST

A new red dye for application to rayon, silk and cotton has been developed by the National Aniline & Chemical Company and placed on the market under the name of National Diazine Bordeaux 7B Conc. This color, when diazotized and developed with Developer B, according to the description, possesses excellent fastness to perspiration, water, cross-dyeing and hot pressing, and moderate fastness to light.

Diazine Bordeaux 7B Conc. is recommended in the announcement for application to goods requiring fastness to washing, such as embroidery yarns, sewing thread, ginghams and shirtings. It is applied to silk in a soap bath broken with acetic acid, and is used either as a self-shade or diazotized and developed. When applied on cotton and wool unions in a cold alkaline soap bath, it is stated, the wool is left clear so that, after developing, the animal fiber may be cross-dyed.

SIXTH NATIONAL COLLOID SYMPOSIUM

The Sixth National Colloid Symposium of the Division of Colloid Chemistry of the American Chemical Society will be held in Toronto, Canada, from June 14 to 16, 1928. Sir William B. Hardy, of Cambridge, England, will be the guest of honor.